1

INSTALLATION RESTORATION PROGRAM

PHASE I – RECORDS SEARCH

RANDOLPH AFB TEXAS

AD-A152 521

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

and

HQ ATC/DEEV
Randolph AFB, Texas

ENGINEERING-SCIENCE

FEBRUARY 1985

PII Redacted

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This report identified and evaluated several potentially hazardous waste disposal sites at Randolph AFB. Records of past waste handling and disposal practices were reviewed. Interviews with past and present installation employees were conducted to develop a history of waste disposal practices. The environmental setting for effectively receiving the waste was evaluated including soils, geology, ground water and surface water. Four sites; including a combined landfill and fire protection training area, a fire protection training area, a POL tank sludge disposal area and waste liquid storage tank were found to have potential to create environmental contamination and follow-on investigations (Phase II) were recommended and outlined.

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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

RANDOLPH AFB

TEXAS

Prepared For

UNITED STATES AIR FORCE

AFESC/DEV

Tyndall AFB, Florida

and

HQ ATC/DEEV

Randolph AFB, Texas

February 1985

Prepared By

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Installation Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Randolph Air Force Base (AFB) under Contract No. F08637 83 G0005 5002.

INSTALLATION DESCRIPTION

Randolph AFB is located approximately 14 miles Northeast of San Antonio, Texas in Bexar County. The main base has an area of 2,893 acres. Two base annexes include Seguin Auxiliary Airfield (961 acres) 23 miles to the east and Canyon Lake Recreation Area (53 acres) 24 miles to the north.

Randolph AFB was dedicated in 1930 and has served primarily for basic pilot, instructor pilot and combat crew training throughout its history. A wide variety and significant numbers of aircraft have been based at the installation. The base has also served as the host to the Headquarters Air Training Command (1957 - present), USAF Manpower Personnel Center (1963 - present), School of Aviation Medicine (1931-1959) and the USAF Helicopter School (1956-1958).

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following points relevant to Randolph AFB:

- The sole source regional aquifer, the Edwards, underlies the northwest portion of Randolph AFB at a depth of 500 feet or greater.
- Randolph AFB lies within the reservoir area and not the recharge zone of the Edwards Aquifer.
- The Edwards Aquifer functions under artesian conditions and is sealed from ground surface by substantial sequences of clay, marl, and sandstone.
- A shallow water table (unconfined) aquifer has been shown to exist on base and may be in communication with local surface waters (Cibolo Creek or Women Hollow Creek) periodically. The full extent of this aquifer is unknown.
- Six inactive wells identified in the area present a potential pathway for waste migration into the Edwards Aquifer by way of deteriorating casing materials.
- Women Hollow Creek rises in the south (golf course) part of Randolph AFB.
- Base surficial soils are predominantly silts and clays that exhibit low permeabilities. More permeable, coarser-grained soils are present at ground surface in zones proximate to local surface waters.
- Annual net precipitation for the area is minus 27 inches. This condition reduces the amount of leachate generation from landfills located on Randolph AFB resulting from precipitation.
- No wetlands exist within the installation boundary.
- Natural populations of either threatened or endangered plants or animals do not exist on the base.

METHODOLOGY

During the course of this project, interviews were conducted with installation personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field surveys were conducted at suspected past hazardous waste activity sites. Nine sites (Figures 1 and 2) were initially identified as potentially containing hazardous contaminants and having the potential for contaminant migration resulting from past activities. These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is a resource management tool and is designed to indicate the relative need for follow-up investigation.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team field inspection, reviews of base records and files, interviews with base personnel, and evaluations using the HARM system.

The areas found to have sufficient potential to create environmental contamination are as follows:

- Landfill No. 2 and Fire Protection Training Area No. 3
- Fire Protection Training Area No. 2 and FPTA Fuel Tank
- POL Tank Sludge Disposal Area
- Tank T-16

The areas judged to have minimal potential to create environmental contamination are as follows:

- Seguin Fire Protection Training Area
- Radioactive Material Burial Site

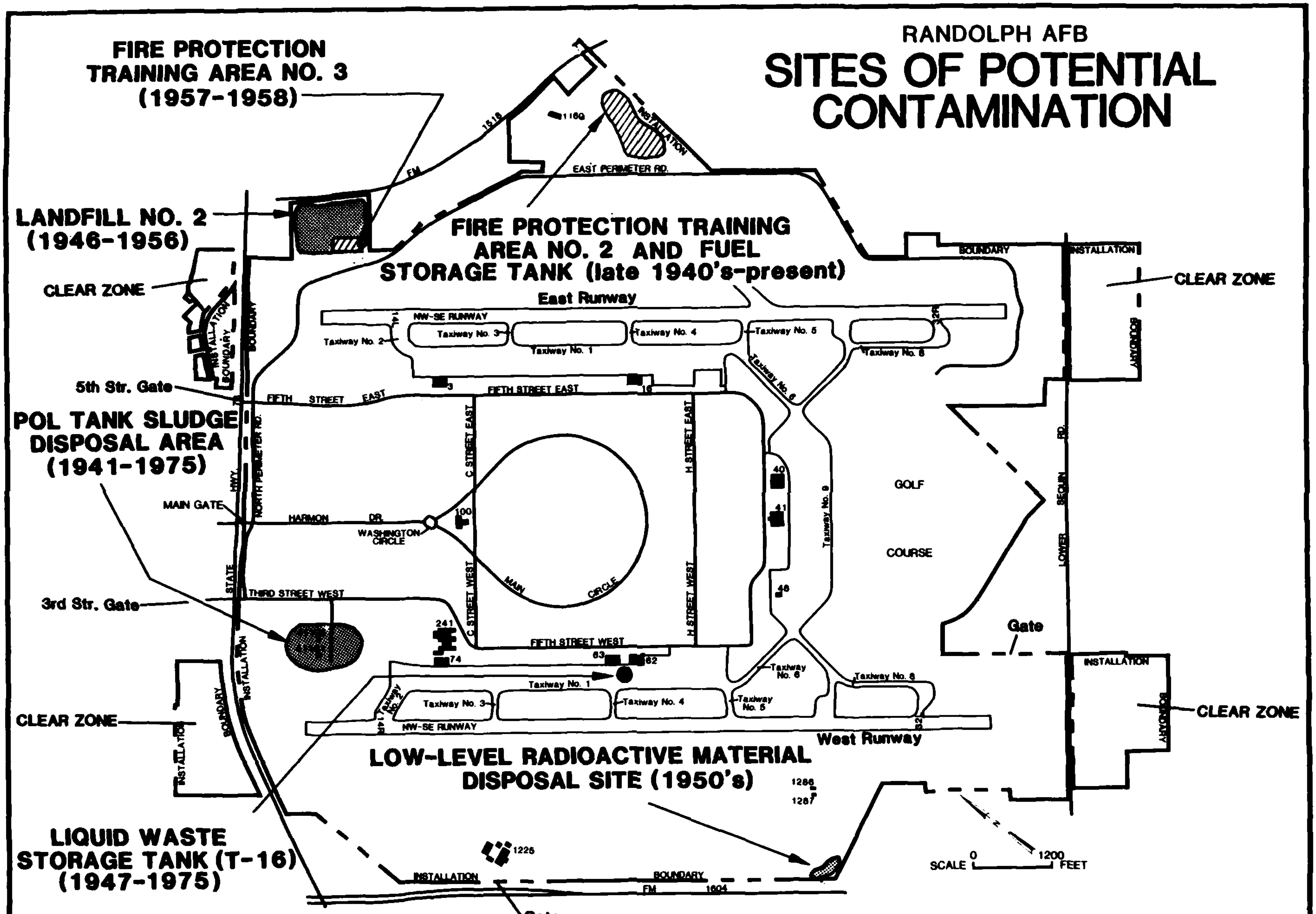
TABLE 1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
RANDOLPH AFB

Rank	Site	Operation Period	HARM Score[(1)]
1	Landfill No. 2 and Fire Protection Training Area No. 3	1946-1956 1957-1958	65
2	Fire Protection Training Area No. 2 and FPTA Fuel Tank	Late 1940's - present	63
3	POL Tank Sludge Disposal Area	1951 - 1975	57
4	Tank T-16	1947-1983	48
5	Seguin Fire Protection Training Area	Late 1960's - early 1970's	46
6	Low-Level Radioactive Material Disposal Site	1950's	22

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual rating forms are in Appendix H.

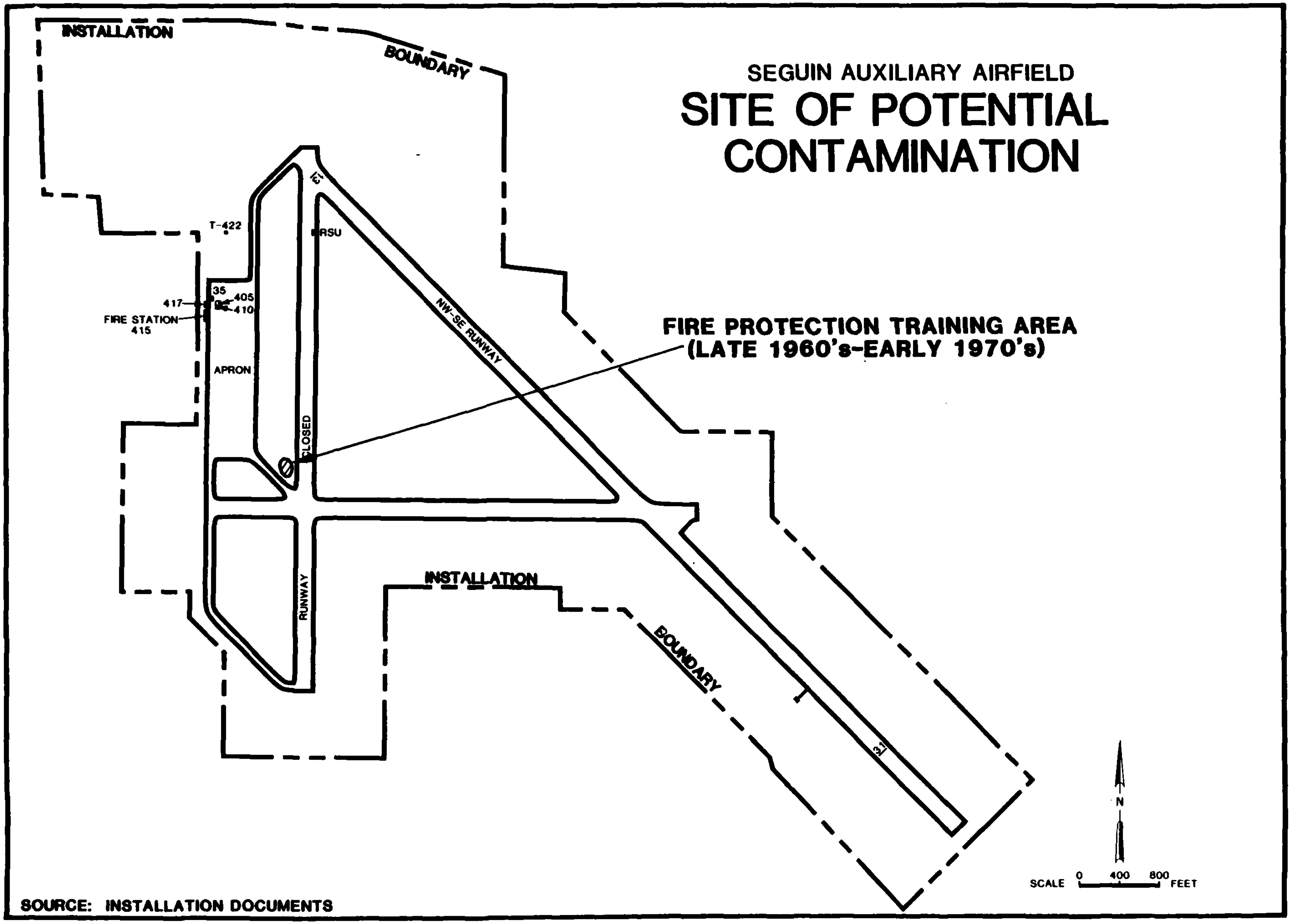
Source: Engineering-Science

FIGURE 1



SOURCE: INSTALLATION DOCUMENTS

FIGURE 2



SEGUIN AUXILIARY AIRFIELD
SITE OF POTENTIAL CONTAMINATION

SOURCE: INSTALLATION DOCUMENTS

Inactive wells at the base may provide a potential pathway for the migration of contamination from ground surface to the regional aquifer. Unplugged casings allowed to corrode or otherwise deteriorate over a period of years may be penetrated, permitting the entry of contaminants near the surface. Contaminants could then migrate vertically in the open well casing to the unprotected aquifer below.

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the disposal sites are presented in Section 6. A program for proceeding with Phase II and other IRP activities at Randolph AFB is also presented in Section 6. The recommended actions include a monitoring well sampling and analysis program to determine if contamination exists at the three sites found to have sufficient potential for environmental contamination. This program may be expanded to define the extent and type of contamination if the initial step reveals contamination. The Phase II recommendations are summarized in Table 2. It is also recommended that inactive or abandoned wells on base be investigated to determine whether they have been abandoned in accordance with the Edwards Underground Water District requirements.

TABLE 2
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT RANDOLPH AFB

Site (Rating Score)	Recommended Monitoring Program
Landfill No. 2 and Fire Protection Training Area No. 3 (65)	Conduct a geophysical survey using electromagnetic conductivity techniques to define the boundary of the filled area. Conduct a magnetometer survey of the site to identify any concentrated areas of buried metals such as drums. Based upon the data obtained in these physical site surveys, locate and install five monitoring wells. One well should be upgradient and the other four should be downgradient near the installation boundary which borders the site. It is anticipated the upper aquifer exists about 20 to 25 feet deep. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the aquifer. Allow the screen to extend above the water table to collect any floating materials. Sample and analyze the ground water for the parameters in Table 6.2.
Fire Protection Training Area No. 2 and FPTA Fuel Tank (63)	Conduct a geophysical survey of the existing burning area and the area north of the existing facilities to the installation boundary to outline subsurface conditions. Using the data from this survey, locate and install four monitoring wells (one upgradient and three downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated about 20 to 25 feet deep). Allow the screen to be above the top of the water table to obtain floating materials. Sample and analyze the ground water for the parameters in Table 6.2.

TABLE 2 (Continued)
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT RANDOLPH AFB

Site (Rating Score)	Recommended Monitoring Program
POL Tank Sludge Disposal Area (57)	Conduct a geophysical survey of the POL sludge disposal area to outline subsurface condition. Using the data from this survey, locate and install four monitoring wells (one upgradient and three downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated at about 20 to 25 feet deep). Sample and analyze the ground water for the parameters in Table 6.2.
Tank T-16 (48)	Install three monitoring wells (one upgradient and two downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated at about 20 to 25 feet deep). Sample and analyze the ground water for the parameters in Table 6.2.

Source: Engineering-Science

SECTION 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission of defense of the United States, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites, and Federal agencies are required to make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP is the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, clarified by Executive Order 12316. CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE

The Installation Restoration Program is a four-phased program (Figure 1.1) designed to assure that identification, confirmation/quantification, and remedial actions are performed in a timely and cost-effective manner. Each phase is briefly described below:

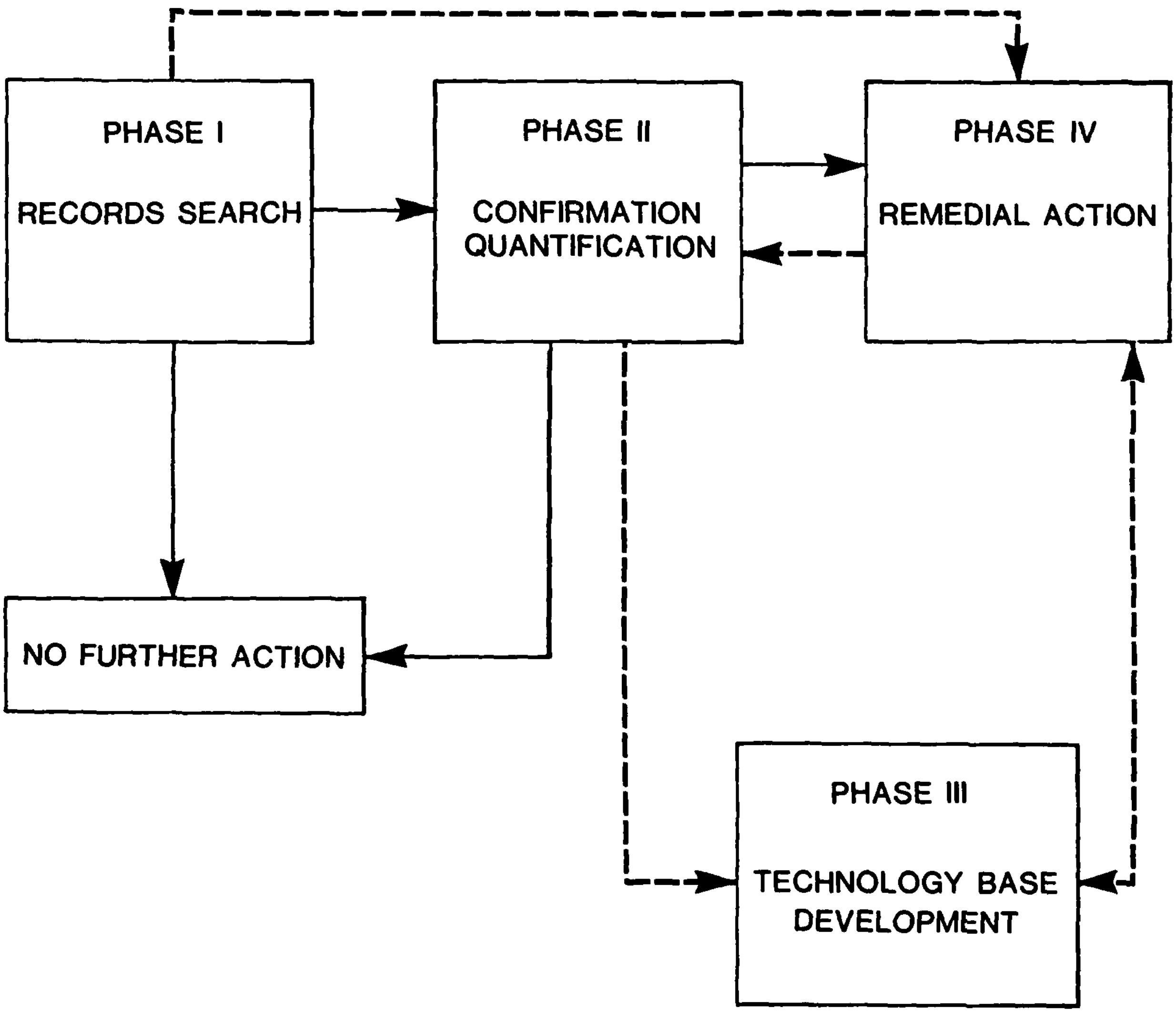
- Phase I - Installation Assessment/Records Search - Phase I is to identify and prioritize those past disposal sites that may pose a hazard to public health or the environment as a result of contaminant migration to surface or ground waters, or have an adverse effect by its persistence in the environment. In this phase, it is determined whether a site requires further action to confirm an environmental hazard or whether it may be considered to present no hazard at this time. If a site requires immediate remedial action, such as removal of abandoned drums, the action can proceed directly to Phase IV. Phase I is a basic background document for the Phase II study.

- Phase II - Confirmation/Quantification - Phase II is to define and quantify, by preliminary and comprehensive environmental and/or ecological survey, the presence or absence of contamination, the extent of contamination, waste characterization (when required by the regulatory agency), and to identify sites or locations where remedial action is required in Phase IV. Research requirements identified during this phase will be included in the Phase III effort of the program.

- Phase III - Technology Base Development - Phase III is to develop a sound data base upon which to prepare a comprehensive remedial action plan. This phase includes implementation of research requirements and technology for objective assessment of adverse effects. A Phase III requirement can be identified at any time during the program.

- Phase IV - Operations/Remedial Actions - Phase IV includes the preparation and implementation of the remedial action plan.

U.S. AIR FORCE INSTALLATION RESTORATION PROGRAM



SOURCE: AFESC

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Randolph AFB under Contract No. F08637 83 G0005 5002. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommended follow-on actions. The land area included as part of the Randolph AFB study is as follows:

Randolph AFB	- 2893 acres
Seguin Auxiliary Airfield	- 961 acres
Canyon Lake Recreation Area	- 53 acres

The activities performed as a part of the Phase I study scope included the following:

- Review of site records
- Interviews with personnel familiar with past generation and disposal activities
- Survey of types and quantities of wastes generated
- Determination of current and past hazardous waste treatment, storage, and disposal activities
- Description of the environmental setting at the base
- Review of past disposal practices and methods
- Reconnaissance of field conditions
- Collection of pertinent information from federal, state and local agencies
- Assessment of the potential for contaminant migration
- Development of recommendations for follow-on actions

ES performed the on-site portion of the records search during September 1984. The following team of professionals were involved:

- R. L. Thoem, Environmental Engineer and Project Manager, MS Sanitary Engineering, 21 years of professional experience.

- J. R. Absalon, Hydrogeologist, BS Geology, 10 years of professional experience.

- J. R. Butner, Environmental Scientist, M. S. Environmental Engineering Sciences, 5 years of professional experience.

More detailed information on these three individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Randolph AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with 65 past and present base employees from various operating areas. Those interviewed included current and past personnel associated with staff civil engineering, San Antonio Real Property Maintenance Agency (SARPMA), fuels management, roads and grounds maintenance, fire protection, real property, history, bioenvironmental engineering, entomology, recreation, radiation safety, field maintenance, supply, flying training and other areas. A listing of interviewee positions with approximate years of service is presented in Appendix B. All figures in this report showing Randolph AFB have used the latest available drawings which delineate the installation.

Concurrent with the employee interviews, the applicable federal, state and local agencies were contacted for pertinent study area related environmental data. The agencies contacted are listed below and in Appendix B.

- U.S. Geological Survey, Water Resources Division (San Antonio, TX)
- U.S. Department of Agriculture, Soil Conservation Service (Hondo, TX)
- Edwards Underground Water District (San Antonio, TX)
- Texas Department of Health, Solid Waste Management Program (San Antonio, TX)
- Texas Department of Water Resources, Water Quality Division (San Antonio, TX)

The next step in the activity review was to identify all sources of hazardous waste generation and to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various sources on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

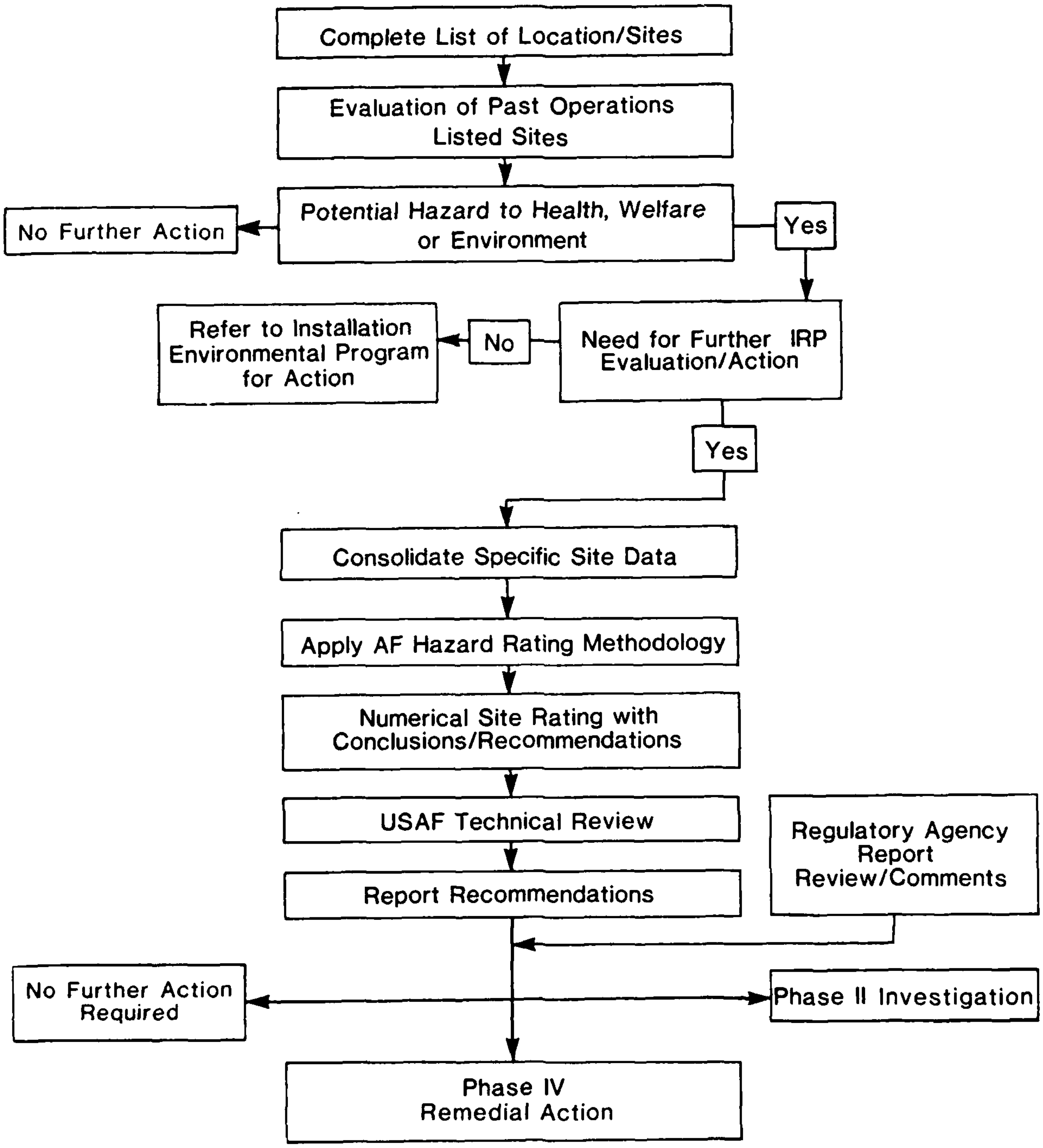
A general ground tour and an overflight of the identified sites were made by the ES Project Team to gather site-specific information including: (1) general observations of existing site conditions; (2) visual evidence of environmental stress; (3) presence of nearby drainage ditches or surface waters; and (4) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential hazard to health, welfare or the environment exists at any of the identified sites using the Flow Chart shown in Figure 1.2. If no potential existed, the site was deleted from further consideration. For those sites where a potential hazard was identified, a determination of the need for IRP evaluation/action was made by considering site-specific conditions. If no further IRP evaluation was determined necessary, then the site was referred to the installation environmental program for appropriate action. If a site warranted further investigation, it was evaluated and rated using the Hazard Assessment Rating Methodology (HARM). The HARM score is a resource management tool which indicates the relative potential for adverse effects on health or the environment at each site evaluated.

FIGURE 1.2

PHASE I INSTALLATION RESTORATION PROGRAM

RECORDS SEARCH FLOW CHART



Source: AFESC

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Randolph AFB is located about 14 miles northeast of San Antonio, Texas in Bexar County. Figure 2.1 shows the location within the region and Figure 2.2 shows the area location. The base is located close to the suburban San Antonio area and is adjacent to Universal City, Texas. Residential and commercial developments border the north and northeast part of the base while other adjoining land is primarily agricultural.

Randolph AFB consists of 2893 acres of Air Force-owned land which is presented in Figure 2.3. Two annexes (Figures 2.1 and 2.2) exist and are described below:

- Seguin Auxiliary Airfield - This annex is located approximately 23 miles east of Randolph AFB and consists of 825 acres of Air Force-owned land (Figure 2.4).

- Canyon Lake Recreation Area - This annex is located about 24 miles north of Randolph AFB and consists of 53 acres of land permitted by the Army.

HISTORY

Randolph AFB was dedicated in 1930 and has always been active in training, including basic and instructor pilot training as well as combat crew training. Training pilots to be instructors continues as a primary mission. A wide variety of aircraft have been based at Randolph in support of the training missions. Randolph AFB became host to Headquarters Air Training Command in 1957 and the USAF Manpower Personnel Center in 1963. The School of Aviation Medicine was at Randolph from 1931 until 1959. The USAF Helicoptor School was at the base from 1956 to 1958.

FIGURE 2.1

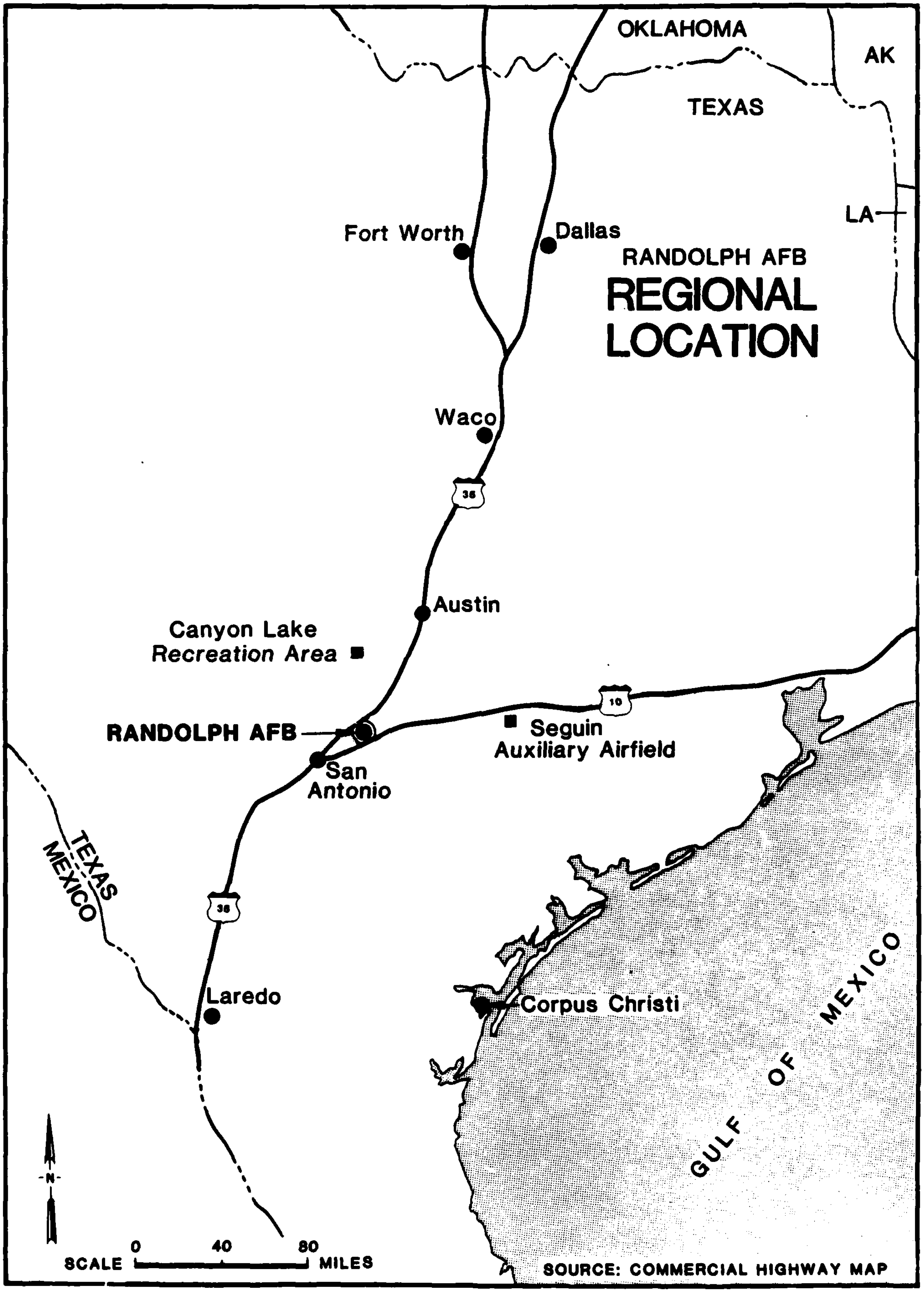
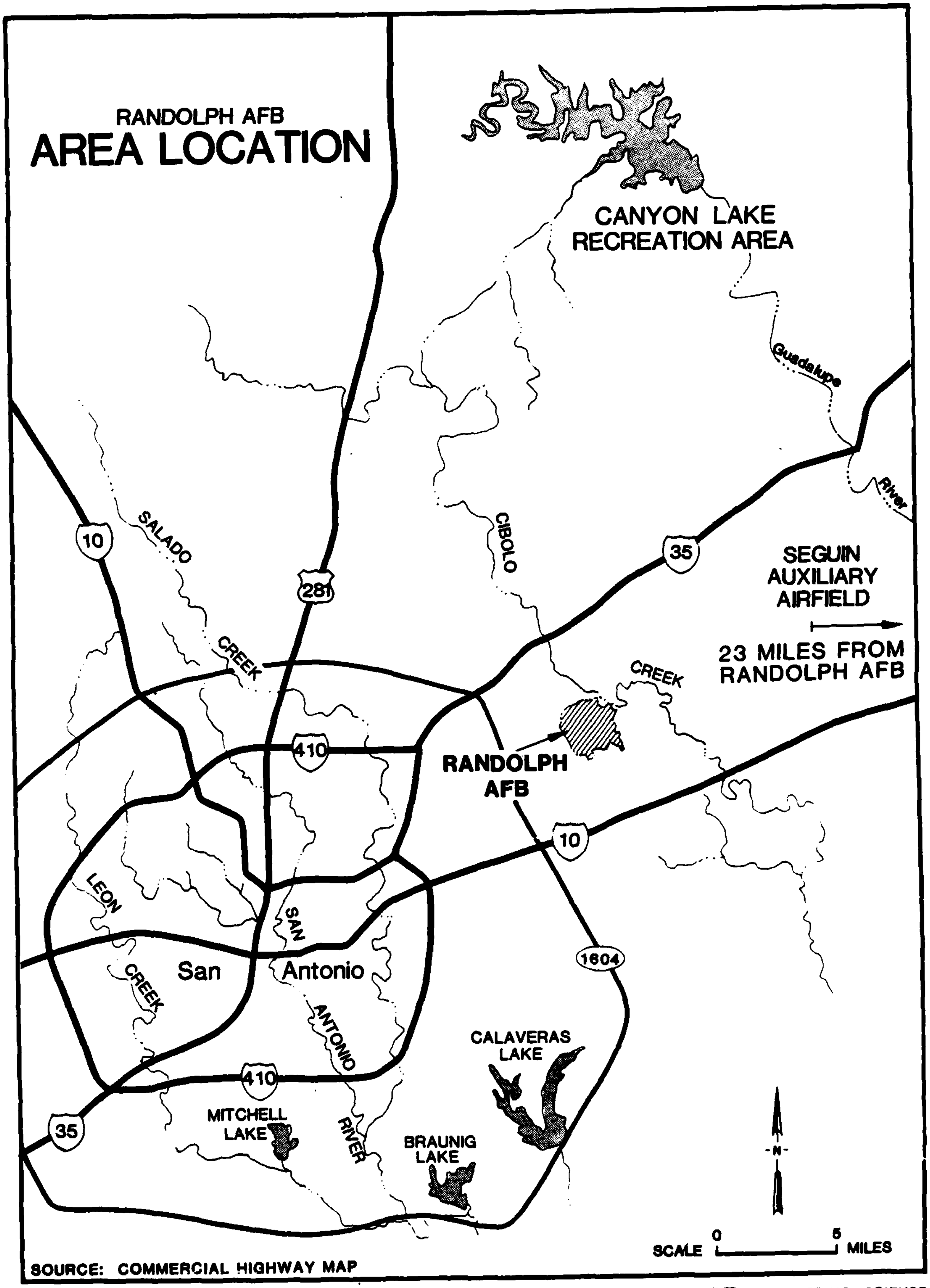
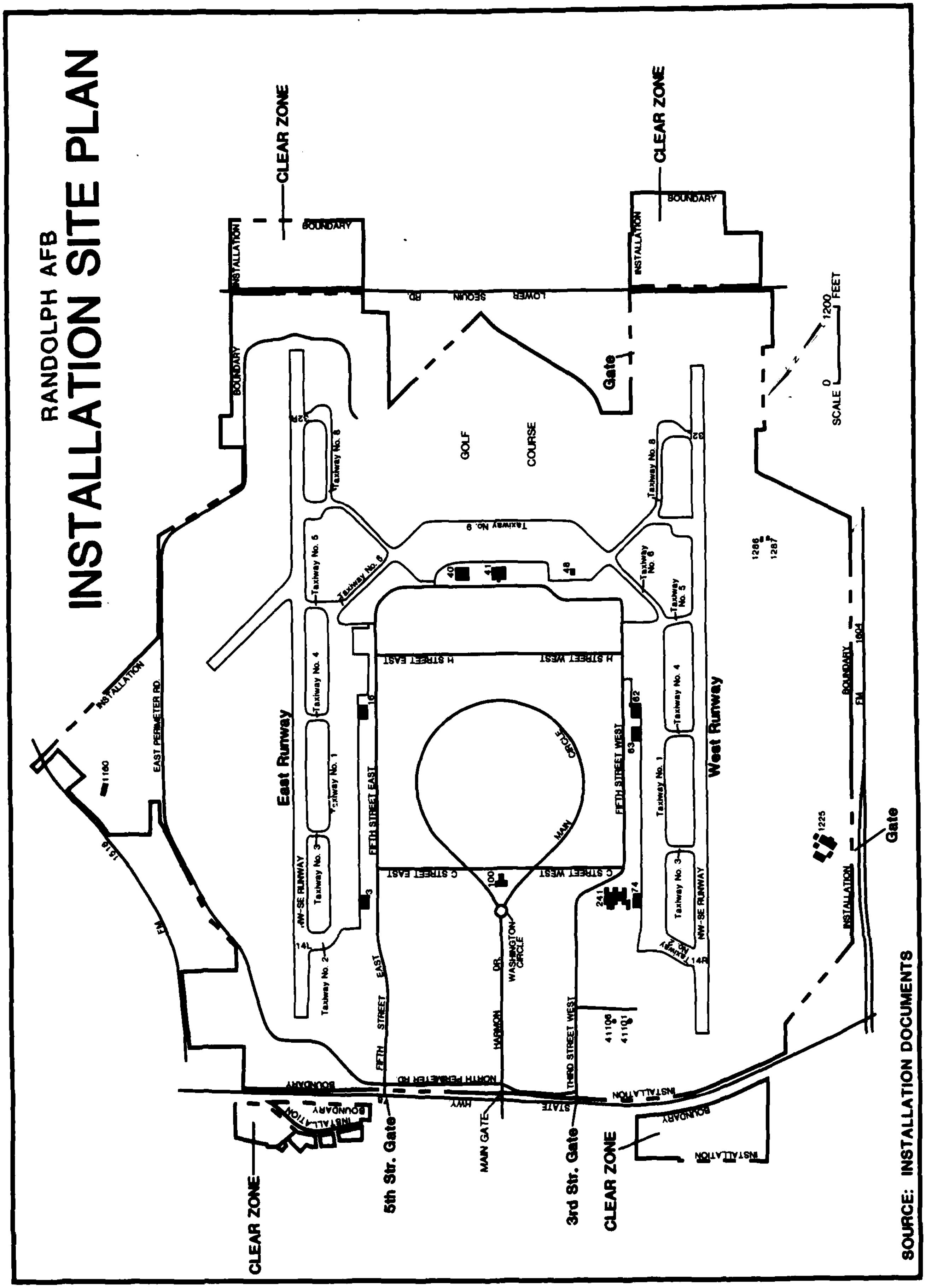

OKLAHOMA
AK
TEXAS
LA
Fort Worth
Dallas
RANDOLPH AFB
REGIONAL
LOCATION
Waco
35
Austin
Canyon Lake
Recreation Area
10
RANDOLPH AFB
Seguin
Auxiliary Airfield
San
Antonio
TEXAS
MEXICO
35
Laredo
Corpus Christi
GULF OF MEXICO
N
SCALE 0 40 80 MILES
SOURCE: COMMERCIAL HIGHWAY MAP

FIGURE 2.2

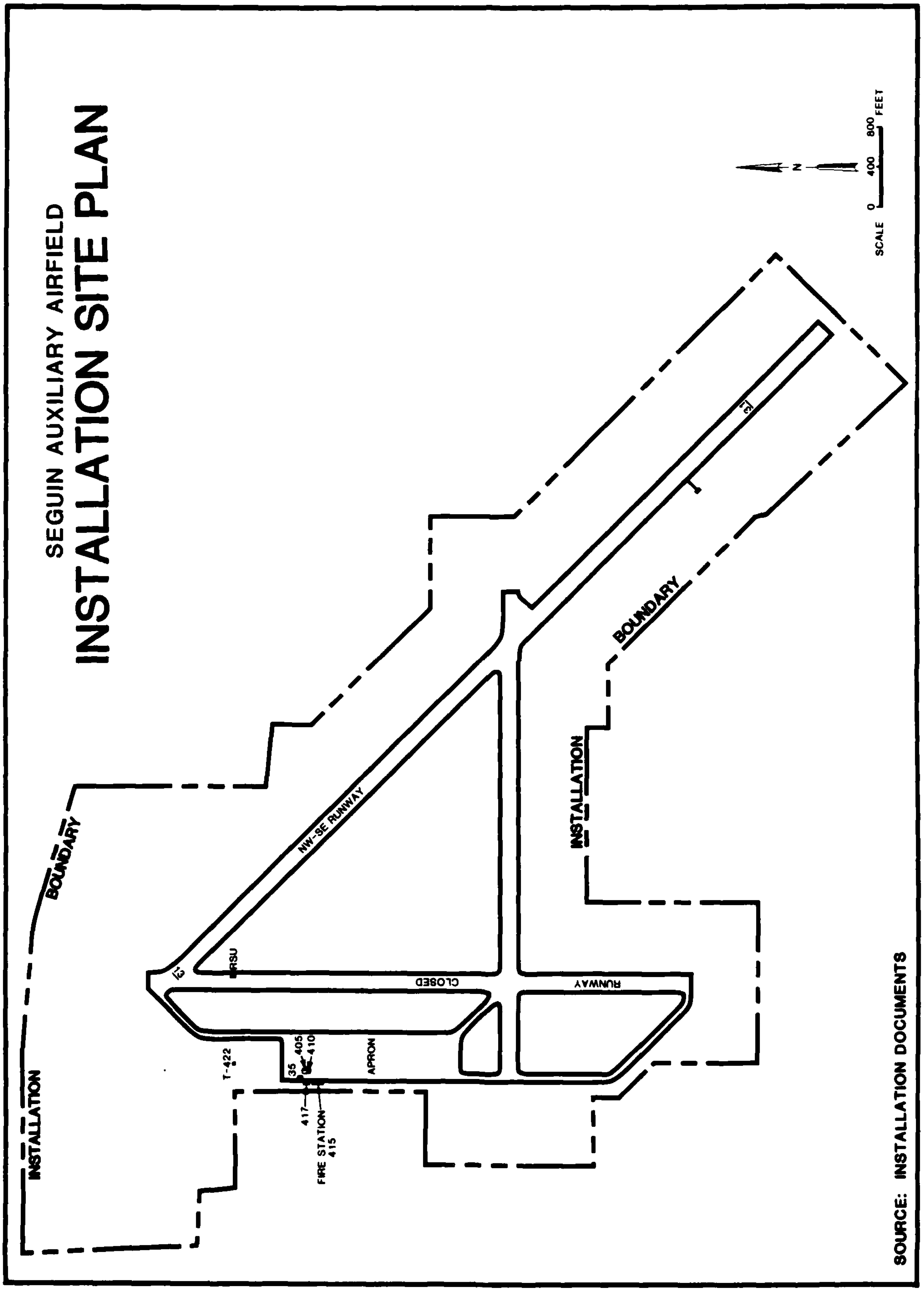


ES ENGINEERING-SCIENCE

FIGURE 2.3


RANDOLPH AFB
INSTALLATION SITE PLAN
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
INSTALLATION
BOUNDARY
LOWER SEGUIN RD.
GOLF
COURSE
Gate
SCALE
0
1200
FEET
East Runway
West Runway
NW-SE RUNWAY
NW-SE RUNWAY
Taxiway No. 1
Taxiway No. 2
Taxiway No. 3
Taxiway No. 4
Taxiway No. 5
Taxiway No. 6
Taxiway No. 8
Taxiway No. 9
32R
32L
14L
14R
EAST PERIMETER RD.
FM
1518
1160
FIFTH STREET EAST
FIFTH STREET WEST
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
MAIN CIRCLE
WASHINGTON CIRCLE
HARMON DR.
THIRD STREET WEST
NORTH PERIMETER RD.
STATE HWY
MAIN GATE
5th Str. Gate
3rd Str. Gate
FM 1604
40
41
48
16
3
62
63
74
100
241
1225
1286
1287
41106
41101
Gate
SOURCE: INSTALLATION DOCUMENTS

2-4


SEGUIN AUXILIARY AIRFIELD
INSTALLATION SITE PLAN
SCALE 0 400 800 FEET
N
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
BOUNDARY
INSTALLATION
NW-SE RUNWAY
CLOSED RUNWAY
APRON
RSU
T-422
35
405
410
417
FIRE STATION 415
SOURCE: INSTALLATION DOCUMENTS

Seguin Auxiliary Airfield was activated in 1942 and later transferred to Randolph in 1956. The airfield was relatively inactive until 1967 when it began to receive more aircraft landing use from Randolph.

The Canyon Lake Recreation Area has been used for about 14 years to provide recreational facilities for Air Force personnel. The area is part of a large complex at Canyon Lake which is under Army ownership. The Air Force uses a portion of the facilities under permit from the Army.

ORGANIZATION AND MISSION

The host unit at Randolph AFB is the 12th Flying Training Wing. Major units within the Wing include Operations, Maintenance, Resource Management, 12th Air Base Group and the USAF Clinic.

The primary mission of the 12th Flying Training Wing is to conduct an instructor pilot training program. The Deputy Commander for Operations directs all the instructor training activities. Providing management of all maintenance resources for the primary mission is the Deputy Commander for Maintenance. All supply, transportation, and other logistical support is under the Deputy Commander for Resource Management. The 12th Air Base Group manages and maintaines all base facilities and service functions. Medical services are provided by the USAF Clinic.

Descriptions of the major tenants at Randolph AFB and their missions are presented in Appendix C.

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Randolph Air Force Base is described in this section with the primary emphasis directed toward identifying features that may affect the movement of hazardous waste contaminants off base. Environmental conditions pertinent to this study are presented at the end of the section.

METEOROLOGY

Temperature, precipitation and other relevant climatic data furnished by Detachment 1, 24th Weather Squadron, Randolph AFB are presented in Table 3.1. These data are representative of the climatic conditions at Seguin Auxiliary Airfield, Canyon Lake Recreation Area and Randolph AFB. The indicated period of record is 43 years. The summarized data indicate that net annual precipitation is minus 27 inches. This condition reduces the amount of potential leachate generation from disposal facilities located on Randolph AFB resulting from precipitation. The one-year 24-hour rainfall for the area is about 3.1 inches which indicates rainfall intensity can be high during a typical year.

GEOGRAPHY AND TOPOGRAPHY

The San Antonio area lies across two distinct physiographic regions, the Edwards Plateau Section of the Great Plains Province and the West Gulf Coast Plain, as depicted on Figure 3.1. The two regions are separated by the east-west trending Balcones Escarpment. Dissection by stream activity has created distinct relief on the Edwards Plateau; typically, elevations range from 1100 to 1900 feet MSL. The plateau is significant to this project as it serves as the precipitation catchment for surface waters flowing to aquifer recharge zones and streams extending through the study area.

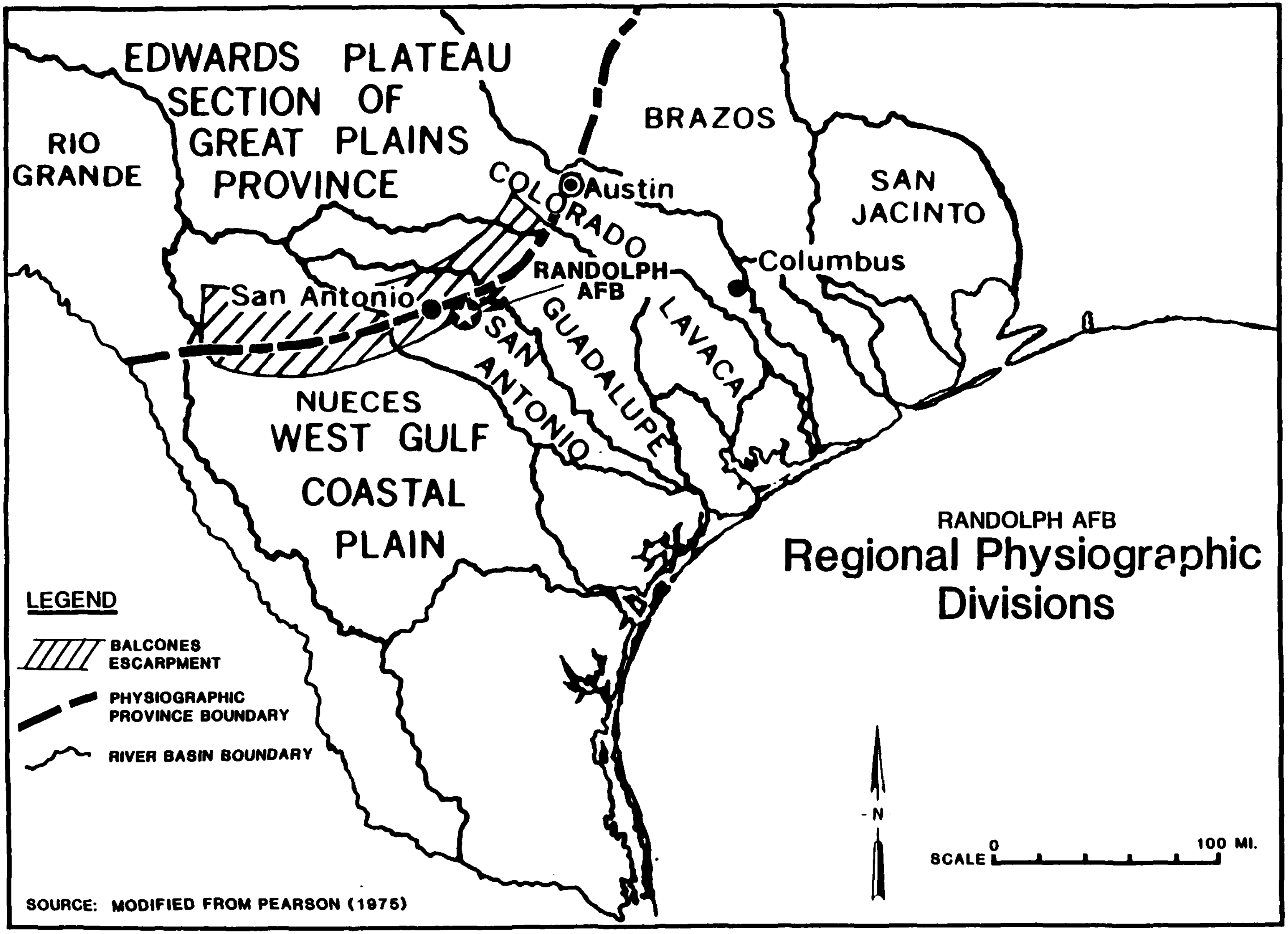
TABLE 3.1
RANDOLPH AFB AREA CLIMATIC DATA

Month	Temperature		Rainfall Precipitation		Snowfall Precipitation	
	Mean Daily Max (°F)	Mean Daily Min (°F)	Monthly Mean (in)	Monthly Max (in)	Monthly Mean (in)	Monthly Max (in)
JAN	61	41	1.7	8.0	#	5
FEB	65	44	2.1	6.7	#	3
MAR	72	50	1.5	5.9	#	#
APR	79	59	3.2	10.2	#	#
MAY	85	66	3.7	13.3	#	#
JUN	91	72	3.1	7.7	0	0
JUL	94	73	1.7	8.6	0	0
AUG	94	73	2.4	8.6	0	0
SEP	89	69	3.9	15.5	0	0
OCT	81	60	3.1	11.4	0	0
NOV	70	49	2.2	7.3	#	#
DEC	64	43	1.6	5.2	#	1
ANN	79	58	30.2	15.5	#	5
EYR	43	43	43	43	35	35

EYR - Years of record
ANN - Annual average

Period of Record: May 1938 - May 1981
Source: Detachment 1, 24th Weather Squadron, Randolph AFB, Texas
Note: # indicates trace accumulations.

FIGURE 3.1



ES ENGINEERING-SCIENCE

The Balcones Escarpment, located north of the base, was created by the faulting of underlying geologic units and is significant since this area corresponds to the recharge zone of the major regional aquifer. Relief changes abruptly cross the escarpment, with elevations ranging from approximately 1100 feet to 700 feet MSL. Randolph Air Force Base is located on the West Gulf Coastal Plain, some 15 miles south of the escarpment. The Coastal Plain consists of a gently undulating prairie, where elevations typically range from 450 feet to approximately 700 feet, MSL. The plain slopes to the southeast gradually toward the Gulf of Mexico. Randolph Air Force Base relief varies from 760 feet National Geodetic Vertical Datum of 1929 (NGVD) in the vicinity of the main gate to approximately 700 feet NGVD at the approximate point where Women Hollow Creek (sometimes known as "Woman Hollering Creek") exits the installation.

Drainage

Drainage of base land areas is accomplished by overland flow to gullies, swales and storm sewers which direct flow to Cibolo Creek or to Women Hollow Creek. A limited amount of runoff originating from the northeast corner of the base is directed to Cibolo Creek. Most installation drainage is directed to Women Hollow Creek which rises on the base in the golf course area. Construction of the base golf course has somewhat modified the course of Women Hollow Creek, resulting in the linear arrangement of small ponds along the south golf course limits. Installation drainage is depicted on Figure 3.2.

Seguin Auxiliary Airfield drainage (Figure 3.3) is accomplished primarily by overland flow to diversion structures to local surface waters. Runoff originating from the westernmost portion of the installation drains to Geronimo Creek. Runoff originating on the east and south parts of the Seguin facility flows to Saul Creek. Both Saul and Geronimo Creeks are tributaries of the Guadalupe River.

Runoff originating from the Canyon Lake Recreation Area generally follows local topography downslope to the lake.

There are no wetlands identified on Randolph AFB or its satellite facilities.

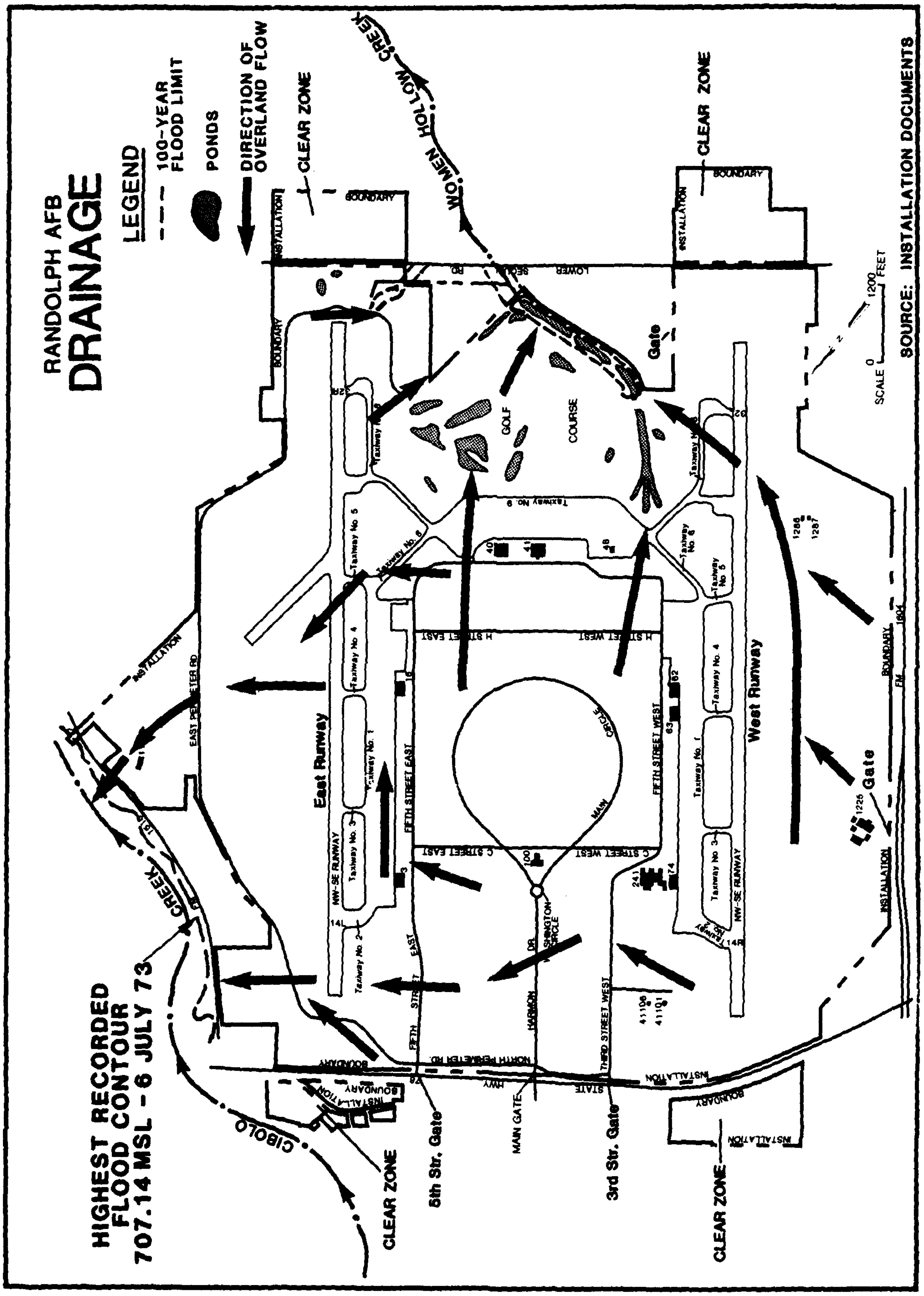
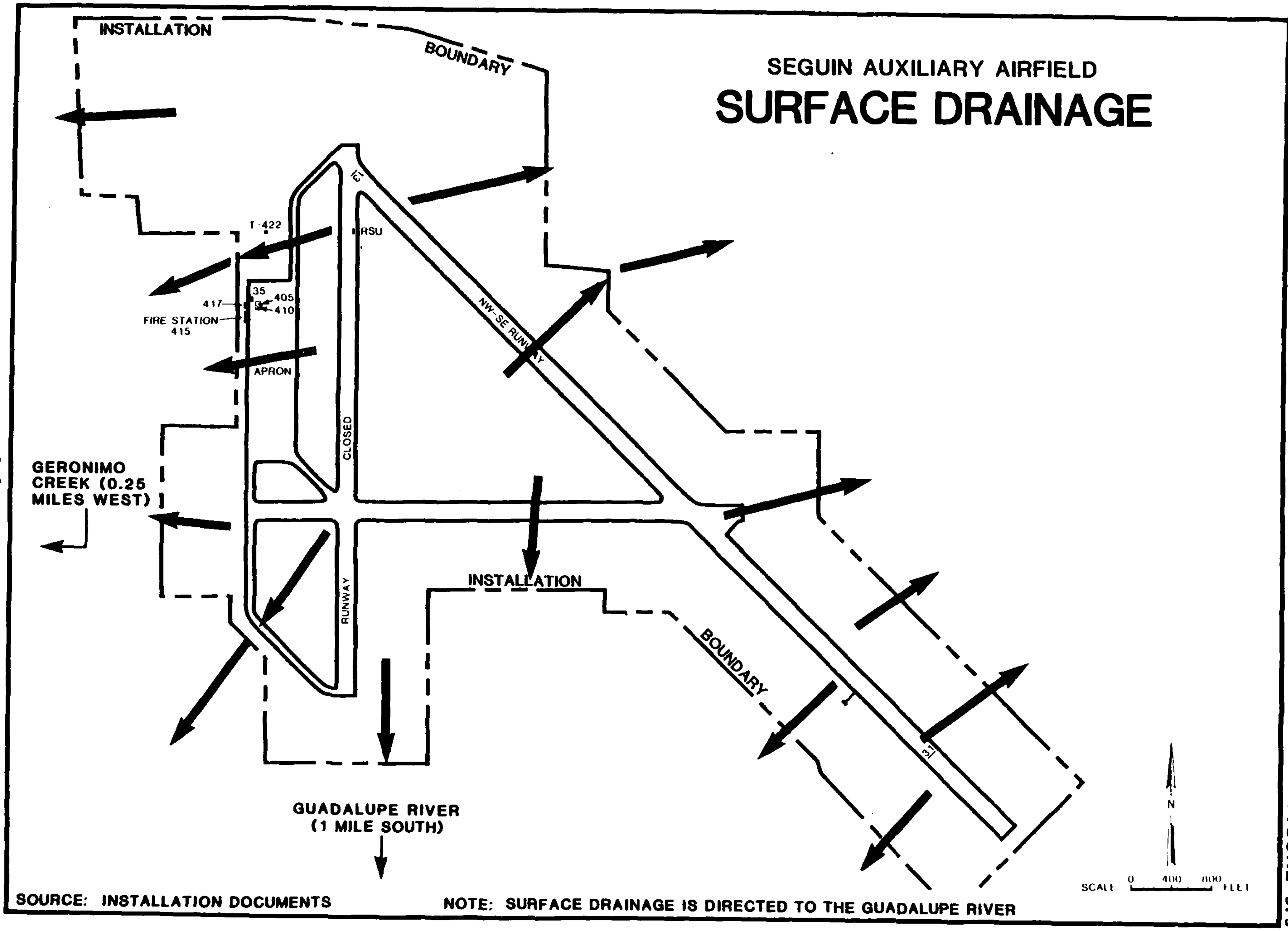

RANDOLPH AFB
DRAINAGE
LEGEND
100-YEAR FLOOD LIMIT
PONDS
DIRECTION OF OVERLAND FLOW
CLEAR ZONE
HIGHEST RECORDED FLOOD CONTOUR 707.14 MSL - 6 JULY 73
CIBOLO CREEK
WOMEN HOLLOW CREEK
East Runway
West Runway
GOLF COURSE
CLEAR ZONE
5th Str. Gate
MAIN GATE
3rd Str. Gate
Gate
Gate
SCALE 0 1200 FEET
SOURCE: INSTALLATION DOCUMENTS

FIGURE 3.3


SEGUIN AUXILIARY AIRFIELD
SURFACE DRAINAGE
INSTALLATION BOUNDARY
NW-SE RUNWAY
CLOSED RUNWAY
APRON
T-422
35
405
410
417
FIRE STATION 415
RSU
13
31
GERONIMO CREEK (0.25 MILES WEST)
GUADALUPE RIVER (1 MILE SOUTH)
N
SCALE 0 400 800 FEET
SOURCE: INSTALLATION DOCUMENTS
NOTE: SURFACE DRAINAGE IS DIRECTED TO THE GUADALUPE RIVER

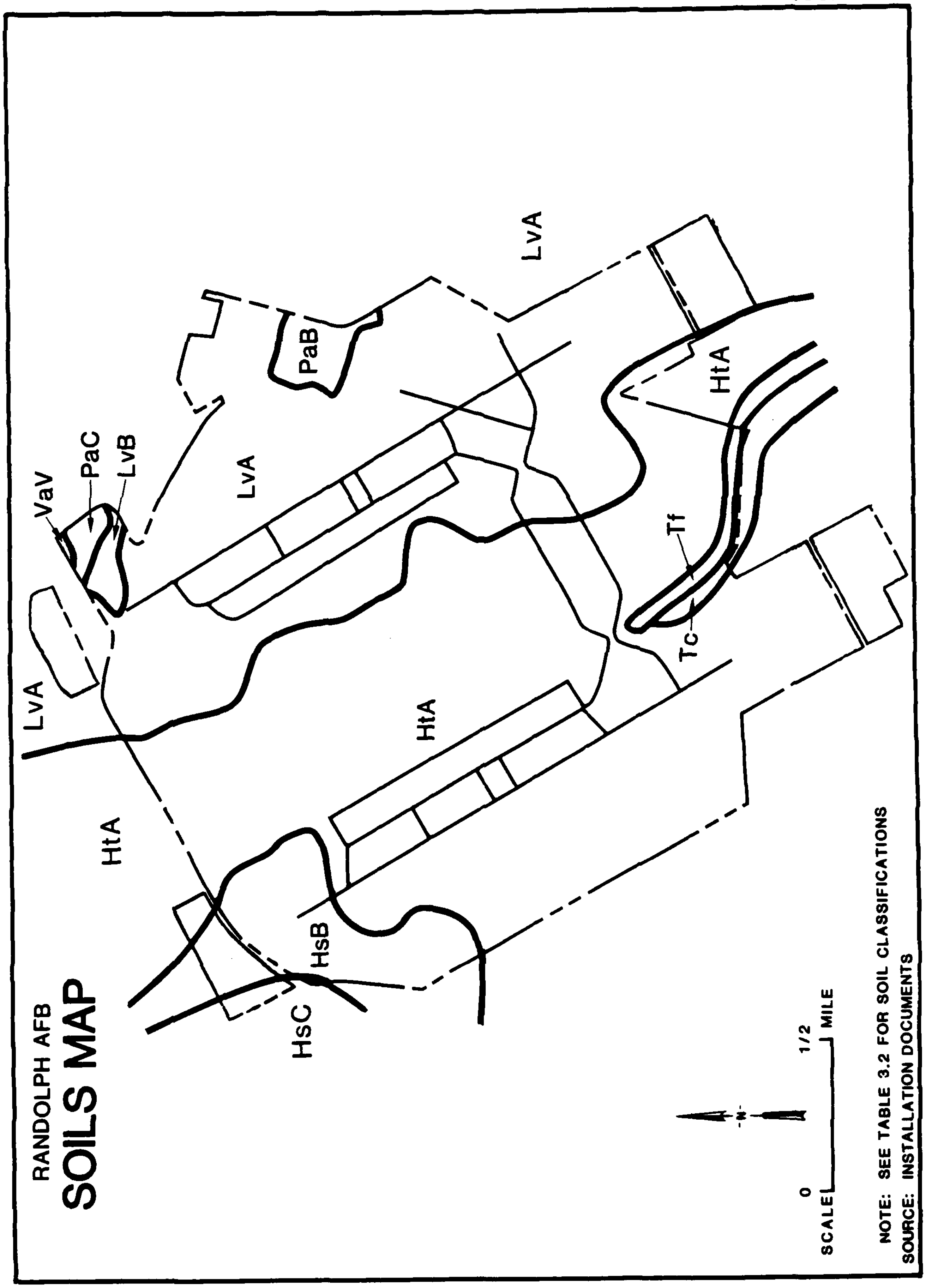
Surface Soils

Surface soils of the installation area have been studied by the USDA, Soil Conservation Service (1966). Ten soil types have been mapped within installation boundaries and are mapped on Figure 3.4. The individual soil types are described on Table 3.2. Base surface soils are typically alluvial, predominantly poorly drained, fine-grained soils possessing generally low permeabilities.

All of the soils units identified on base are known to be underlain by thin, discontinuous, or stratified, locally significant gravel layers. The gravel is associated with the alluvial development of the project area. A gravel layer was encountered in the golf course area during a subsurface exploration. The gravel appeared to be a relatively extensive deposit, based upon the widely-spaced borings which encountered it (based on a report by Raba-Kistner Consultants, Inc., dated August 2, 1984). The gravels are exploited in the Randolph AFB study area as a mineral resource. They commonly occur along or adjacent to modern stream channels.

The soils of the Seguin Auxiliary Airfield have been identified as belonging to the Brannon-Barbarosa-Lewisville Association. These soils are deep, moderately well drained to well drained, nearly level to gently sloping clayey soils developing on stream terraces (USDA, SCS, 1977). The stream terraces are classified as "ancient alluvium". A typical soil profile is 64 inches thick and consists of clay over silty clay loam. Runoff is slow to medium and permeability is low.

The soils of the Canyon Lake Recreational Area are reported to be the Brackett-Comfort-Real Association. These materials are shallow undulating to steep soils, well drained and underlain by limestone or strongly cemented chalk on uplands of the Edwards Plateau. Limestone ledge outcrops give hillsides a benched or stepped appearance. The typical soil profile is quite variable in thickness and consists of gravelly clay loam, stoney clay or gravelly loam. Local runoff is medium to rapid. The usefulness of this unit is limited by the generally shallow depths to bedrock (USDA, SCS, 1984).



RANDOLPH AFB
SOILS MAP

NOTE: SEE TABLE 3.2 FOR SOIL CLASSIFICATIONS
SOURCE: INSTALLATION DOCUMENTS

TABLE 3.2
SOILS CLASSIFICATIONS FOR RANDOLPH AIR FORCE BASE

Symbol	Description (Major Fraction)	Thickness, in.	Unified Classification (Major Fraction)	Permeability, in/hr.	Disposl Site Use Constraints
HsB	Houston black clay. Clay, silty clay, some gravel, underlain by marl, chalk or marly clay. 1-3 percent slopes.	38-64	CH, CL	0.1 - 0.6	Slight
HsC	Houston black clay. Clay, silty clay, gravel, chalk and marl. 3-5 percent slopes.	38-84	CH, CL	0.1 - 0.6	Slight
HtA	Houston black clay. Clay, gravelly clay, loam, grading into gravelly aluvium. 0-1 percent slopes.	42-120	CH, CL or GC	0.3 - 1.5+	Severe. Underlain by gravel connecting to local surface waters. Moderate due to permeability.
LvA	Lewisville silty clay. Silty clay, silty clay loam, gravel. 0-1 percent slopes.	0-62	CL	1.0 - 1.2	Moderate due to permeability.
LvB	Lewisville silty clay. Silty clay, silty clay loam, gravel. 1-3 percent slopes.	0-62	GL	1.0 - 2.0	Moderate due to permeability.
PaB	Patrick soils. Clay loam, loam, silty clay loam over gravel. 1-3 percent slopes.	0-60+	CL, CH, ML-CL over GM, GC	2.0 - 5.0	Severe. Underlain by gravel.
PaC	Patrick soils clay loam, loam, silty clay loam over gravel. 3-5 percent slopes.	0-60+	CL, CH, ML-CL over GM, GC	2.0 - 5.0	Severe. Underlain by gravel.
Tc	Trinity clay. Clay over stratified clayey alluvium with gravel leyers, locally.	40-70	CH	0.2 - 0.4	Severe. Underlain by clayey and gravelly alluvium, near streams.
Tf	Trinity and Frio soils. Clay and sandy clay loam over gravel locally.	0-84+	CL, CH, over GM, SM or CL	1.0 - 2.5	Severe. Subject to flooding. Underlain by gravel.
VaA	Venus loam. Loam and clayey loam over loamy alluvium or gravel. 0-1 percent slopes.	30-62	CL or ML-CL	2.0-2.5	Severe. Subject to flooding, permeability and is underlain by gravel.

Source: USDA, Soil Conservation Service, 1966.

GEOLOGY

The geology of the San Antonio area has been reported by Sellards, et al. (1932, reprinted 1981), Arnow (1959 and 1963), McIntosh and Behm (1967) and the Texas Bureau of Economic Geology (1974), among others. A brief review of the published information has been summarized in support of this investigation.

Stratigraphy

Geologic units ranging in age from cretaceous to quaternary have been described in the San Antonio area and are presented as Table 3.3. The lithologies of these units include consolidated materials and sedimentary rocks.

Distribution

The surficial geology of Randolph Air Force Base is dominated by the Lower Pleistocene age Leona Formation (from Geologic Atlas of Texas, San Antonio Sheet, 1983). The Leona Formation consists primarily of fine calcareous silt grading down into coarse gravel, clayey gravel or sandy gravel. The surface expression of this unit is that of a relatively level inactive alluvial fan (or slopewash) reposing above modern stream channels. Widely separated installation construction test borings and a geotechnical study conducted in the south part of the installation (golf course) by Raba-Kistner Consultants, Inc. (1984) confirm this identification. The upper portion of the Leona appears to be a calcareous clay, silty clay, or similar fine-grained material, some three to twenty feet thick. The lower member of the Leona appears to be a calcareous clayey gravel, sandy gravel or gravel and boulders with a maximum thickness on the crder of twenty feet. The Leona Formation is underlain by the Taylor Marl at a depth of 24 feet at building 700 (from installation test boring 8AGC-82). The Taylor is reported to be a thick sequence of marl and calcareous clay in the study area and is of particular importance as it acts as a major confining unit, isolating the underlying regional aquifer from overlying geologic units.

The surface geology of the Seguin Auxiliary Airfield is similar to that of Randolph AFB. The surface materials are predominantly calcareous clays over silty clays and silts. The airfield is located in an area mapped as an inactive alluvial fan (or slopewash) by Kier, et al. (1977).

TABLE 3.3
RANDOLPH AIR FORCE BASE STRATIGRAPHY

System	Series	Group	Stratigraphic Unit	Approximate Maximum Thickness (feet)	Character of Material	Water-supply Properties
Quaternary	Recent and Pleistocene	--	Alluvium	45	Silt, sand & gravel	In places yields water for stock and domestic wells.
Teritiary	Pliocene	--	Uvalde gravel	30	Coarse flinty gravel in matrix of clay or silt.	Not known to yield water to wells in Bexar County
Tertiary	Eocene	Claiborne	Mount Selman formation	200	Sand and clay with iron concretions.	Not known to yield water to wells in Bexar County.
			Carrizo sand	800	Coarse to medium-grained sand and sandstone; some clay.	Yields moderate supplies of potable water.
		Wilcox	Undifferentiated deposits	1,070	Thin-bedded sand and sandstone and some clay, lignite and calcareous concretions.	Yields moderate supplies of water of good to poor quality.
	Paleocene	Midway	Wills Point formation	490	Arenaceous clay containing numerous arenaceous and calcareous concretions.	Not known to yield water to wells in Bexar County.
Cretaceous	Gulf	Navarro	Kemp clay, Escondido formation, and Corsicana marl	535	Clay and marl.	Not known to yield water to wells in Bexar County.
			Taylor marl	540	Marl and calcareous clay.	Not known to yield water to wells in Bexar County.
			Anacacho limestone	355	Marly chalk.	Not known to yield water to wells in Bexar County.
			Austin chalk	210	Limestone and argillaceous chalky limestone.	Yields small to large supplies of water of good to poor quality.
			Eagle Ford shale	40	Calcareous and sandy shale and some Argillaceous limestone.	Not known to yield water to wells in Bexar County.

TABLE 3.3 (Continued)
RANDOLPH AIR FORCE BASE STRATIGRAPHY

System	Series	Group	Stratigraphic Unit	Approximate Maximum Thickness (feet)	Character of Material	Water-supply Properties
Cretaceous (Continued)	Comanche	Washita	Buda limestone	80	Dense, hard limestone.	Yields sufficient water near the outcrop for stock and domestic use.
			Grayson shale (Del Rio clay)	60	Blue clay, weathering greenish and yellowish brown.	Does not yield water to wells in Bexar County.
			Georgetown limestone	65	Hard massive limestone and argillaceous limestone	Yields large supplies of water for municipal, industrial, and irrigation supplies. Forms the principal aquifer in the county. Water is highly mineralized downdip in the southern part of the county.
		Fredericksburg	Edwards limestone	600+	Hard semicrystalline massive limestone and dolomite and some thin-bedded limestone and marley limestone.	
			Comanche Peak limestone	40	Light-gray massive limestone and marl.	
			Walnut clay	20	Sandy clay or marl.	Not known to yield water to wells in Bexar County.
		Trinity	Glen Rose limestone	1,200	Massive chalky limestone alternating with beds of less resistant marly limestone.	Generally yields sufficient water in the outcrop for stock and domestic use. Water from deeper wells generally is more highly mineralized than is water from shallow wells.
			Pearsall formation	190	Shale and limestone	Not known to yield water to wells in Bexar County.

TABLE 3.3 (Continued)
RANDOLPH AIR FORCE BASE STRATIGRAPHY

System	Series	Group	Stratigraphic Unit	Approximate Maximum Thickness (feet)	Character of Material	Water-supply Properties
Cretaceous (Continued)	Pre-Comanche (Coahuila of Mexico)	(Nuevo Leon of Mexico)	Sligo formation	1,100	Limestone, dolomite and shale.	Not known to yield water to wells in Bexar County.
	(Nuevo Leon and Durango of Mexico)	Hosston formation			Limestone, shale and sandstone.	Yields small to moderate supplies of water which becomes more highly mineralized downdip toward the southern part of the county.
Pre-Cretaceous		Sedimentary and metamorphic			Slate, black limestone, and schist.	Not known to yield water to wells in Bexar County.

Source: Arnow, 1959

The geology of the Canyon Lake Recreational Area is dominated by the upper member of the Glen Rose Formation. The Glen Rose consists of limestone, dolomite and marl, alternating as eroded and resistant beds forming stairstep topography. This area is significant as it is located in the catchment zone for the Edwards Aquifer. Precipitation is "captured" in this area and directed downslope in numerous stream channels which cross the recharge zone of the principle regional aquifer.

Structure

Randolph Air Force Base occupies a position within the tectonically significant Balcones Fault Zone. Normal faulting in this area has been attributed to the settlement of the Gulf of Mexico geosyncline, which is presently receiving large quantities of terrestrial sediments. Faulting has occurred along parallel lines trending roughly from southwest to northeast across the study area. The faulting is significant because it has modified the gross structure of area geologic units and has permitted the development of secondary porosity in some units. According to Arnow (1959) many of the faults are not traces of discrete separation but are actually shatter zones which have created a series of smaller step faults along parallel lines. Displacement along individual fault lines may vary from twenty feet to several hundred feet, with the greatest amount of movement occurring near the fracture center. Total vertical displacement observed in strata extending between the Edwards Plateau and the coastal Plain is on the order of 3000 feet.

The sedimentary rocks of Bexar County tend to strike east-northeast and dip south-southeast toward the Gulf of Mexico. In the north part of the county, the dip averages ten to fifteen feet per mile (relatively flat). In the southern part of the county the dip increases to 150 feet per mile, which may be due in part to the previously discussed faulting. According to the work of McIntosh and Behm (1967), compartmentalized faulting may have altered local strike and dip relationships from the reported regional trends.

HYDROLOGY

Ground-water hydrology of the Randolph Air Force Base-San Antonio area has been reported by Arnow (1959, 1963), Garza (1962), Pearson et al. (1975), Baker and Wall (1976), Maclay and Small (1976) USBR (1978), Metcalf and Eddy, Inc. (1979), Muller and Price (1979), Marquardt and Elder (1979), Maclay et al. (1980), and Maclay et al. (1981 and 1984). Additional information has been obtained from interviews with officials of the U.S. Geological Survey Water Resources Division (USGS-WRD) and the Edwards Underground Water District (EUWD). Information describing shallow aquifer conditions was obtained from installation test boring data.

Edwards (Balcones Fault Zone) Aquifer

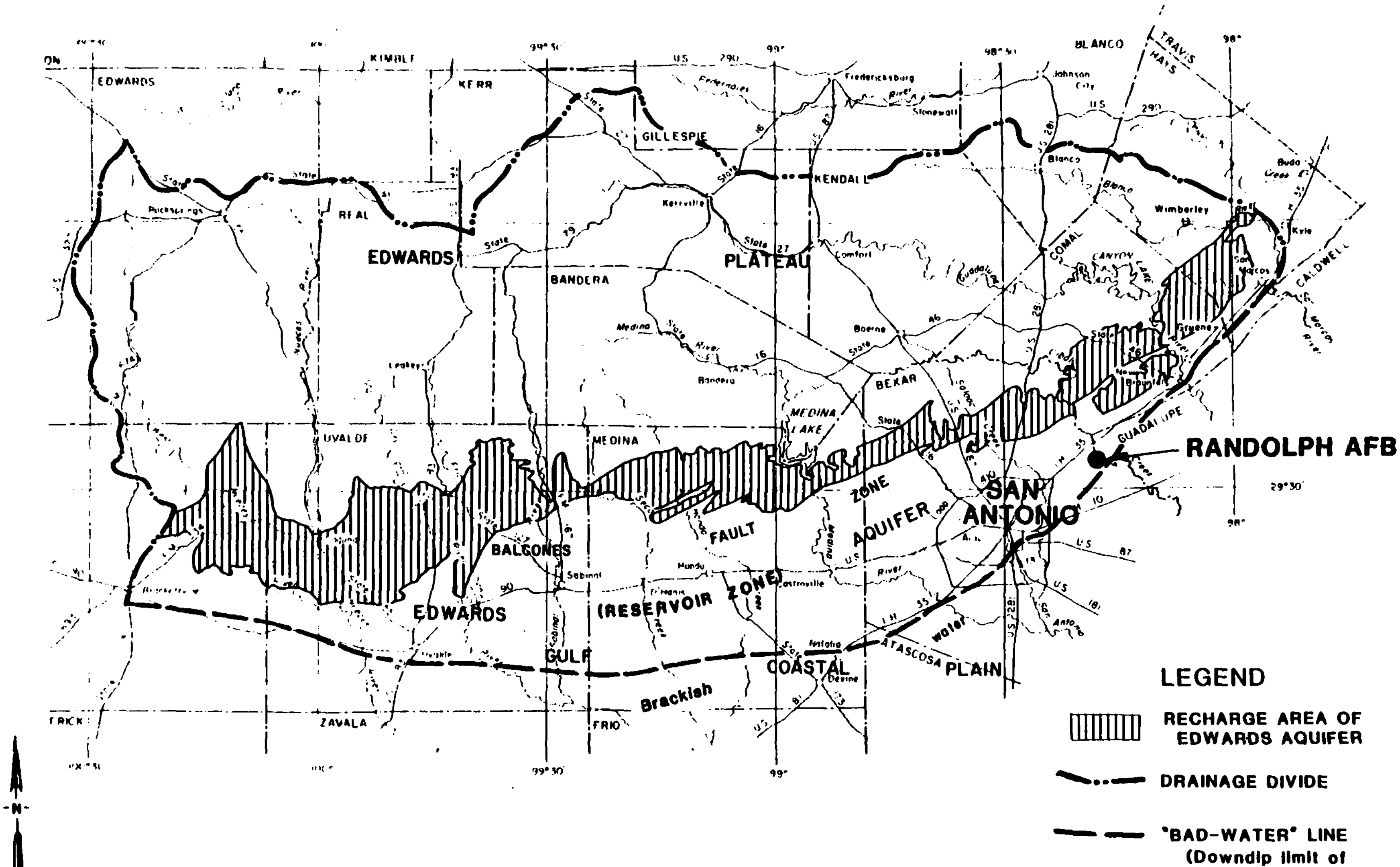
The northwest portion of Randolph Air Force Base lies over the Edwards (Balcones Fault Zone) Aquifer, which is defined as a "sole source" aquifer by the USEPA. In 1959, the Texas Legislature created the Edwards Underground Water District to provide for the systematic planning and protection of subsurface water resources derived from the Edwards Aquifer. Regulatory authority is governed by the Texas Water Code Section II, Chapters 156.20.01.001-.019 and extends into the recharge zone (outcrop area) located north of the reservoir zone.

The area underlain by the Edwards Aquifer sweeps an arc extending from Kinney County to the west, to Hays County on the east aquifer boundary. This area is approximately 175 miles long and varies in width from 5 to 30 miles. The west, north and east aquifer boundaries are defined geologically where hydrogeologic units crop out forming the generally acknowledged recharge zone or where ground-water divides exist. The south aquifer boundary is arbitrarily defined as the "bad water line" where total dissolved solids concentrations exceed 1,000 milligrams per liter. Randolph AFB is located along the approximate alignment of the "bad water line" A cooperative USGS-WRD and EUWD study scheduled for Fiscal Year 1985 will attempt to define the true limits of the "bad water line" at Randolph AFB and vicinity. The aquifer (reservoir) area and its associated recharge zone are shown on Figure 3.5.

Regionally, the Edwards Aquifer consists of three hydrogeologic units which are known to be hydraulically continuous: the Georgetown Limestone, the Person Formation (limestone) and the Kainer Formation (limestone). The limestone units are described as being thin to massive-bedded, nodules, cherty, gypseous, argillaceous white to gray

FIGURE 3.5

RANDOLPH AFB
EDWARDS AQUIFER AREA



NOT TO SCALE

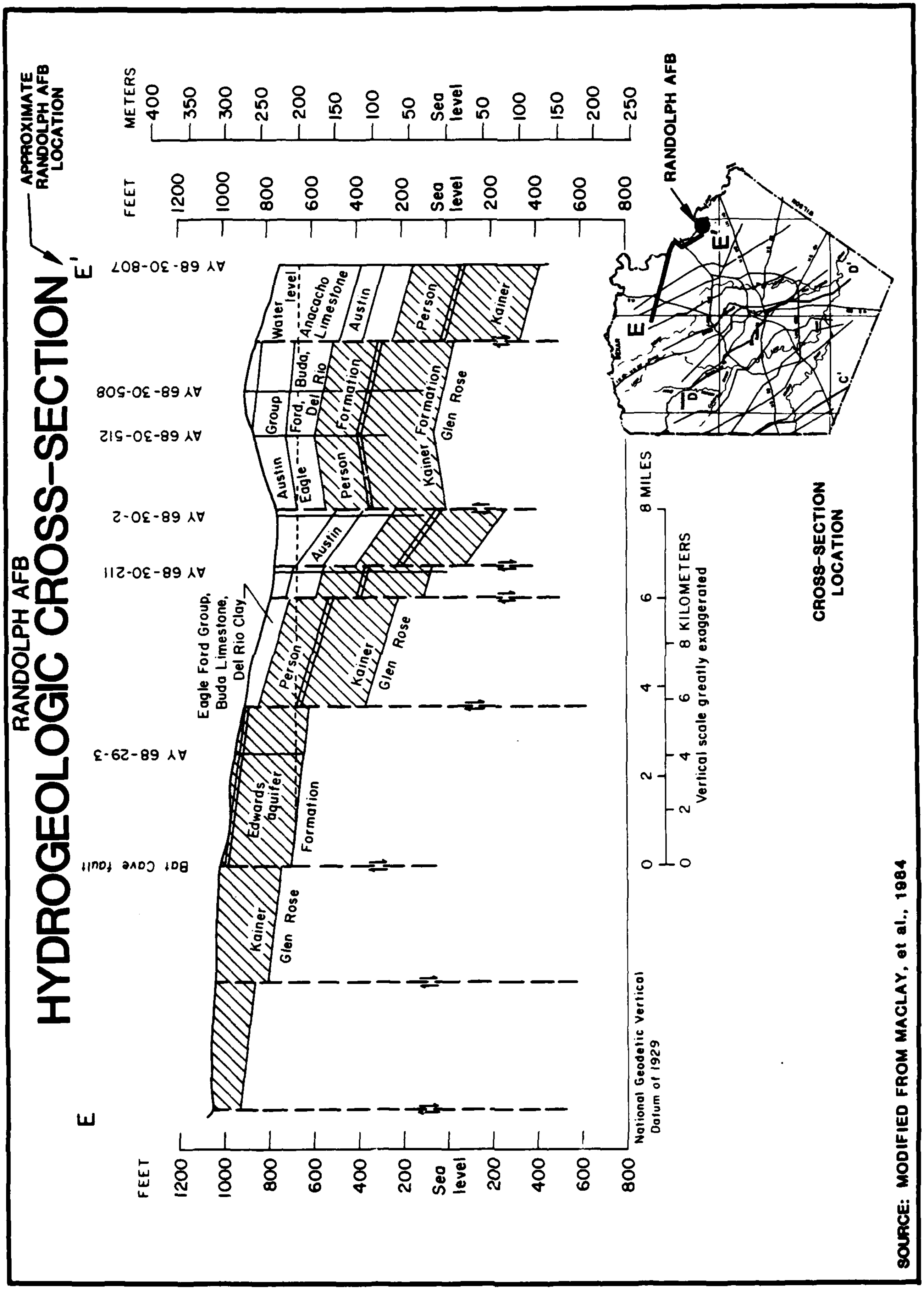
SOURCE: MODIFIED FROM MACLAY, et al., (1980) limestone and dolomite. The rock is characterized by an extensively honeycombed, cavernous structure created by solution channeling over wide areas.

The Edwards Aquifer lies beneath Randolph AFB ranging from 500 feet at Well 11 to 700 feet at Well 1. The cross-section depicted in Figure 3.6 illustrates hydrogeology typical of the study area. This cross-section indicates a typical aquifer thickness of 580 feet in the study area.

The Edwards Aquifer is confined at its base by the Glen Rose Formation and at its upper surface by the Del Rio Clay or correlative units. Water is contained in the Edwards under artesian conditions.

The Edwards is recharged principally by the downward percolation of surface waters from streams traversing the area of outcrop and by precipitation inflitration in this same zone. Figure 3.7 depicts the recharge area in a generalized cross-section. In areas where streams cross the aquifer area of outcrop, numerous large solution channels have been observed (Arnow, 1959). Similar large solution channels have been noted on driller's well logs in the reservoir zone several miles to the south. Once water has entered the Edwards, it moves rapidly downdip (Maclay, 1981) principally in solution channels such as those shown in the hypothetical flow diagram presented as Figure 3.8. Ground-water flow directions are both to the south (downdip along formation gradients) and to the east-northeast paralleling the fault system and according to prevaling hydraulic gradients (Pearson, et al, 1975). Figure 3.9 depicts water levels within the Edwards as of July 1978 with approximate ground-water flow directions. It should be noted here that local variations in flow directions may occur.

The quality of ground water derived from the Edwards has been studied by Reeves (1976), Maclay et al. (1980) and Reeves et al. (1980 and 1984), among others. Water quality is generally considered to be acceptable in wells sampled north of the "bad water line" shown on Figure 3.5. Because of its highly prolific nature, the Edwards is easily susceptible to contamination in the recharge (outcrop) zone, but not in the reservoir zone where Randolph Air Force Base is located. In the reservoir zone, the Edwards Aquifer is tightly confined and under strong artesian pressure.

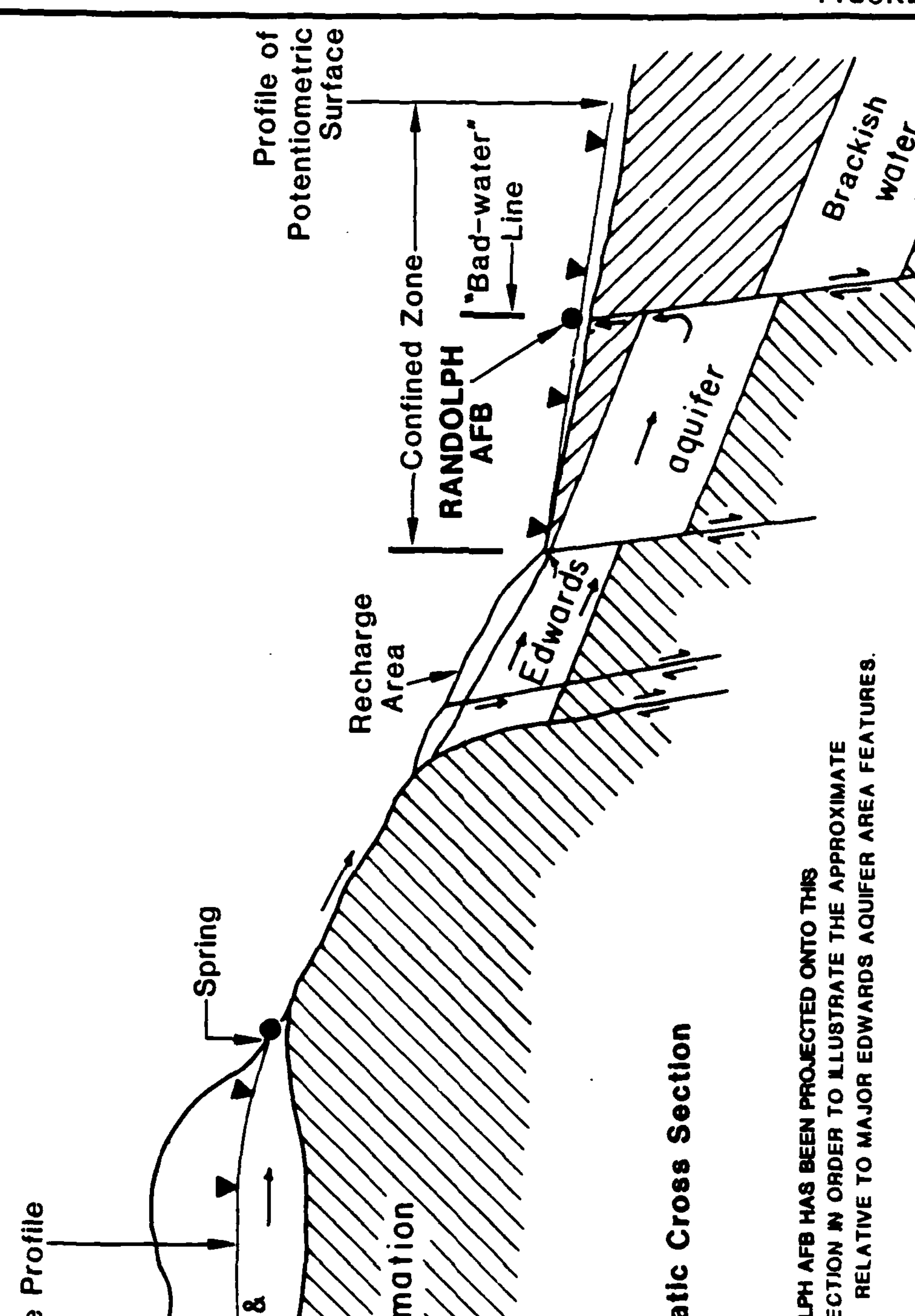


SOURCE: MODIFIED FROM MACLAY, et al., 1984

FIGURE 3.7

RANDOLPH AFB

GENERALIZED EDWARDS AREA CROSS-SECTION



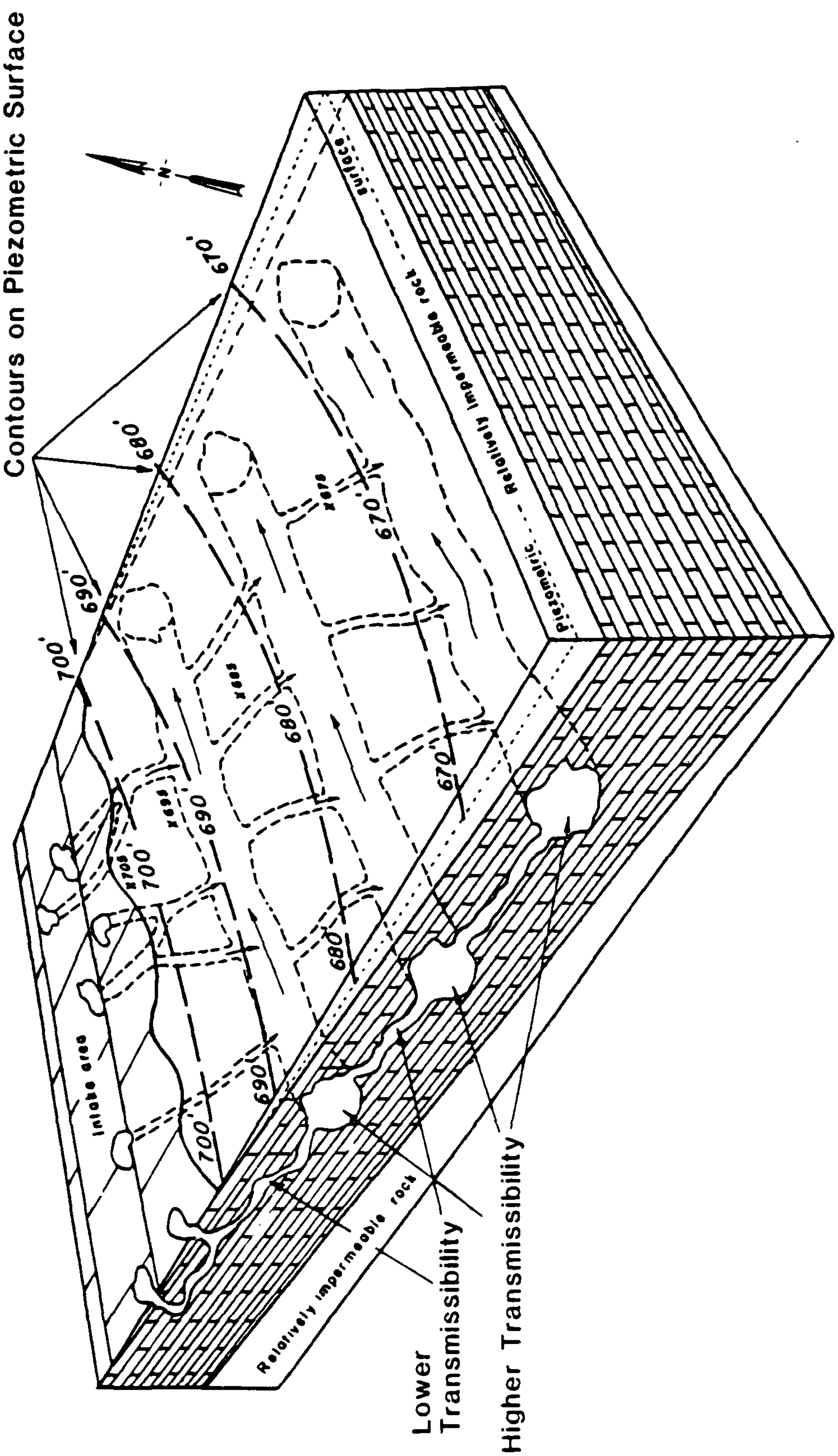
NOTE: THE POSITION OF RANDOLPH AFB HAS BEEN PROJECTED ONTO THIS GENERALIZED CROSS-SECTION IN ORDER TO ILLUSTRATE THE APPROXIMATE LOCATION OF THE BASE RELATIVE TO MAJOR EDWARDS AQUIFER AREA FEATURES.

SOURCE: MODIFIED FROM MACLAY et al (1981)

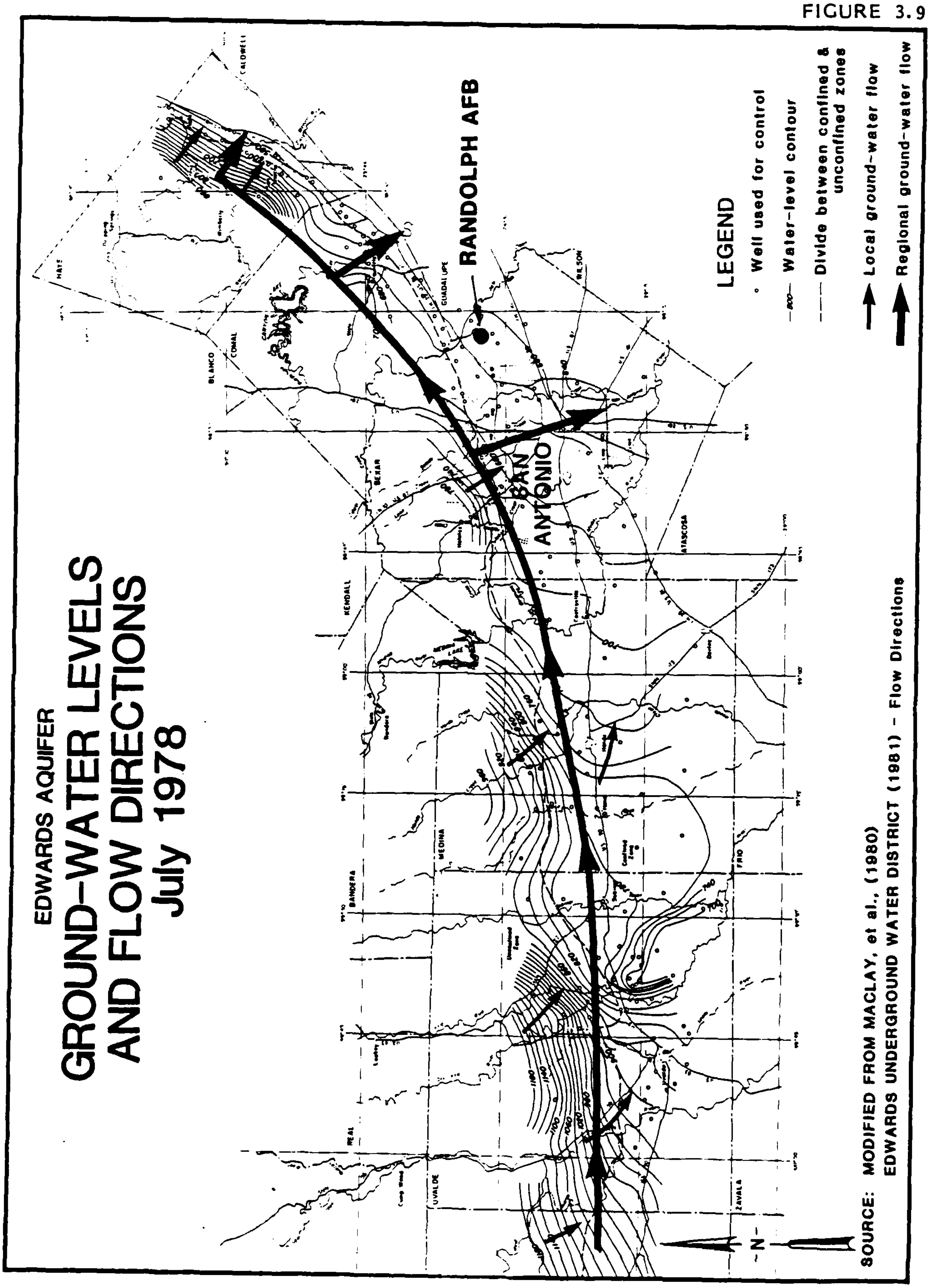
ES ENGINEERING-SCIENCE

EDWARDS AQUIFER

HYPOTHETICAL FLOW DIAGRAM



SOURCE: MODIFIED FROM ARNOW (1959)



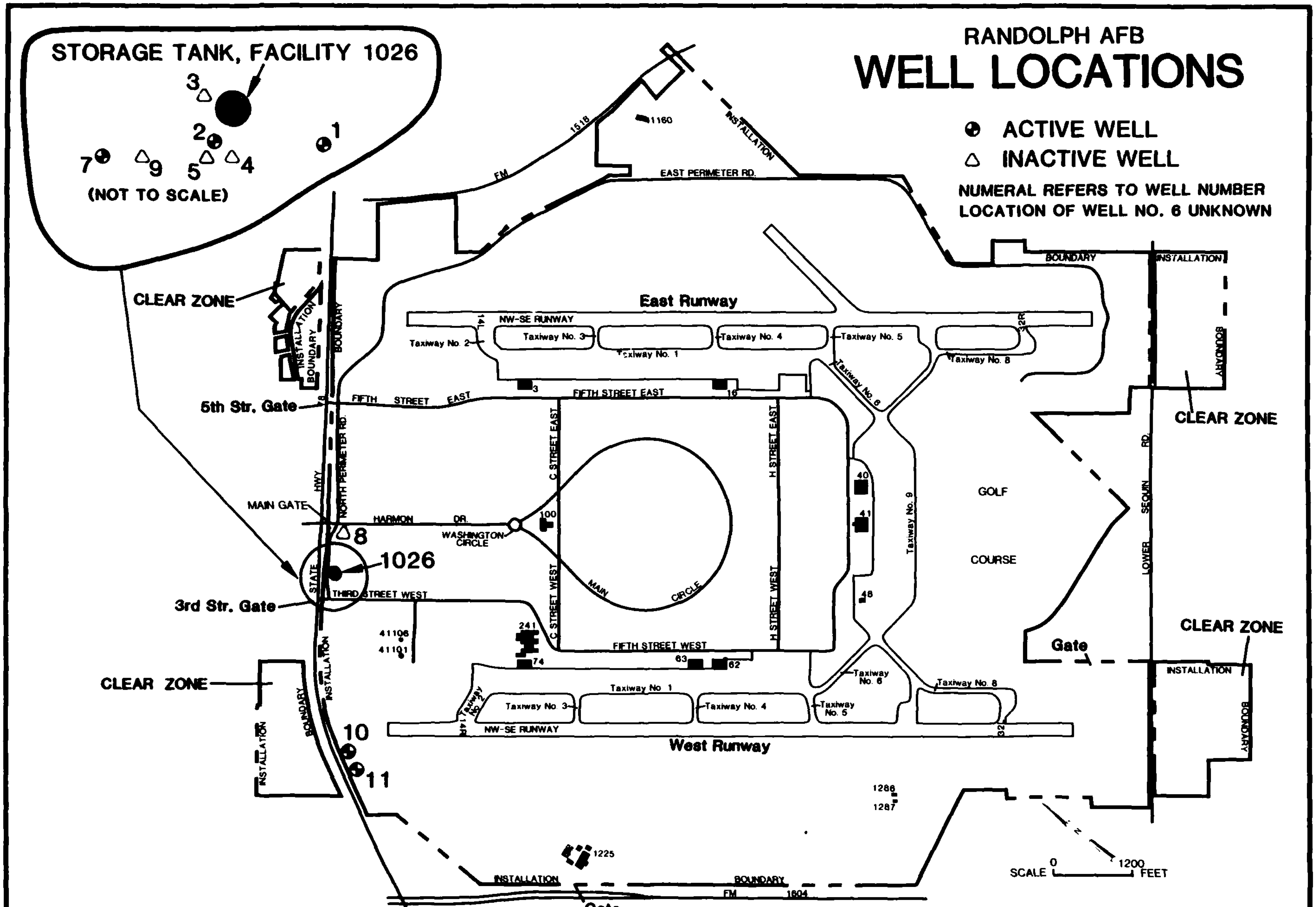
ES ENGINEERING-SCIENCE

At present, Randolph AFB draws water supplies from five base wells, all of which are finished in the Edwards Aquifer. Installation wells have been constructed individually and are not all concentrated in a well field. The locations of base wells are presented as Figure 3.10. Six inactive wells are present on the installation. It is not known if they have been adequately sealed. Base wells presently in service range in finished depth from 514 feet (Well No. 10) to 700 feet (Well No. 1). Information recorded during 1978 indicate that water levels ranged from 80 to 125 feet below land surface at the base. Base water well data is summarized as Table 3.4. Installation water well supplies are generally of good quality, with hardness being the only problem constituent. Wells installed at the south part of the base would probably encounter the high chloride and hardness levels characteristic of the "bad water line".

Seguin Auxiliary Airfield purchases potable water from the Spring Hills Water Supply Corporation.

The Canyon Lake Recreational Area has a well. The well is reported to be 525 feet deep and it derives ground water from a "dark blue limestone". No well log is available but this information was obtained from incomplete installation file data. This may be a reference to the Edwards or to a correlative unit. The static water level in the Canyon Lake well was reported to be 98 feet below grade.

The physical separation between the Edwards Aquifer and surface or shallow aquifers in the reservoir area (Randolph AFB) has been well documented. Because of this separation, the migration of contaminants from shallow zones into the deeper Edwards Aquifer is very unlikely. There is, however, a possibility that old, inactive wells could possibly provide a contaminant pathway via corroded or breached well casings. This possibility was confirmed in northeast San Antonio in November 1983 by the Edwards Underground Water District which used direct down-hole inspection to confirm the migration of gasoline into an inactive well and finally into the Edwards Aquifer. Supply wells obtaining water from the Edwards, located one-half mile from the pollutant source were found to be contaminated with gasoline (from Bader, 1984). For this reason, water wells that are taken out of service and will no longer be used must be plugged in accordance with the guidelines established by the



SOURCE: INSTALLATION DOCUMENTS

TABLE 3.4
RANDOLPH AFB WELL CONSTRUCTION DATA

Well Number	Diameter (in.)	Depth (ft.)	Nominal Capacity (GPM)	Depth to Water[1] (ft.)	Aquifer[2]	Remarks
1	12,15	700	400	98	Edwards	-
2	12	563	125	80	Edwards	-
3	12	584	-	-	Edwards	Inactive-Dry
4	-	584	-	-	Edwards	Inactive-Dry
5	12	584	-	-	Edwards	Inactive-Dry
6	12	609	-	-	Edwards	(3)
7	12	583	350	125	Edwards	-
8	12	577	-	-	Edwards	Inactive-Oil from Equipment
9	12	1,003	-	-	Edwards	Inactive-High Sulphur
10	13	518	1250	125	Edwards	-
11	8	544	1100	125	Edwards	-
Canyon Lake	6	525	400	98	Edwards	High Iron Levels

Source: Installation Documents and USGS.

(1) Date of measurement unknown.
(2) Estimated.
(3) USGS indicates a Well No. 6 but no base records provide information on it. It is believed this well may have been located where FM 78 now exists outside the Third Street West Gate.

Edwards Underground Water District to provide an adequate level of protection to the regional aquifer.

Shallow Aquifer Zones

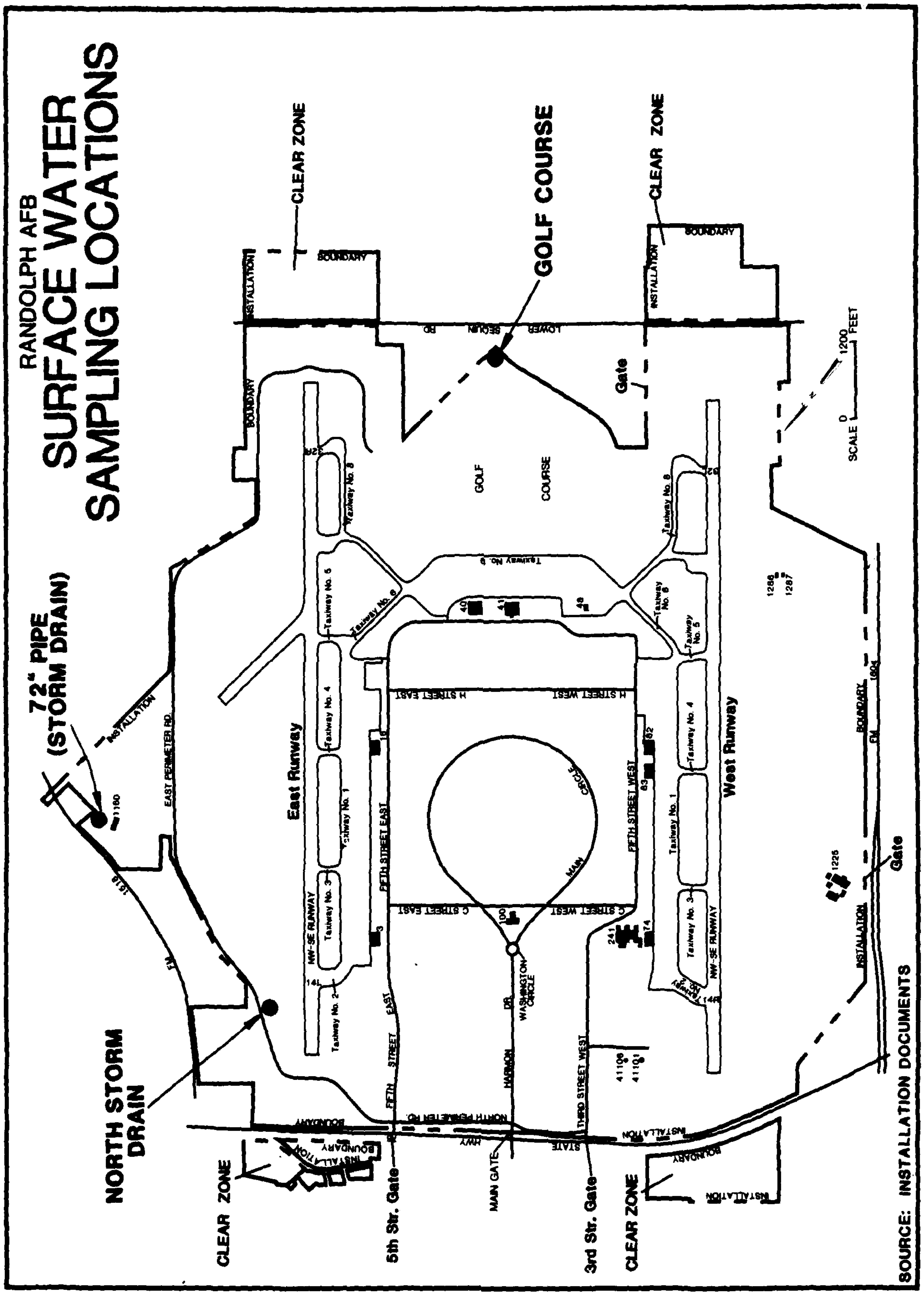
Coarse-grained alluvium deposited by existing or now abandoned stream channels exists at shallow depths throughout much of the study area. The granular alluvium typically begins at depths in the range of two to ten feet below present land surface and varies in thickness. Ground water contained in the alluvium may be present at depths below ground surface in the range of ten to twenty feet. This condition has been interpreted by McIntosh and Behm (1967) to indicate that a perched water table exists in the general study area. Saturated gravel was encountered during a geotechnical study in the golf course area (Raba-Kistner Consultants, Inc., 1984). The perched water table system is probably recharged directly by precipitation and/or where the granular materials are intersected by the course of local surface waters. Flow directions, persistence and lateral limits of this perched system are uncertain.

Alluvium present near the courses of modern streams is known to be utilized as a source of water supplies in the study area. Water may be obtained by utilizing either drilled or dug wells constructed to depths of less than one hundred feet in depth.

Surface Water Quality

The Texas Department of Water Resources has regulatory responsibility for the maintenance of water quality in the Randolph AFB area. The applicable Surface Water Quality Standards for general surface waters are contained in Appendix D. The Cibolo Creek and Women Hollow Creek segments of the San Antonio River Basin at Randolph AFB are deemed usable for non-contact recreation, propagation of fish and wildlife, and domestic raw water supply by the Texas Department of Water Resources.

Randolph AFB currently monitors installation surface water discharges on a routine basis at the three locations shown on Figure 3.11. A review of historic water quality monitoring data indicates that heavy metals have periodically been noted in base surface water discharges to local streams for the period 1976-1983. Specifically, lead, iron, copper, manganese and zinc have been detected in samples obtained from the 72-inch storm drain and the north storm drain. Results obtained


RANDOLPH AFB
SURFACE WATER
SAMPLING LOCATIONS
72" PIPE
(STORM DRAIN)
NORTH STORM
DRAIN
GOLF COURSE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
INSTALLATION BOUNDARY
LOWER SEGUIN RD
GOLF COURSE
Gate
Gate
SCALE 0 1200 FEET
East Runway
West Runway
NW-SE RUNWAY
EAST PERIMETER RD.
NORTH PERIMETER RD.
STATE HWY
FM 1518
FM 1604
FIFTH STREET EAST
FIFTH STREET WEST
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
HARMON DR
WASHINGTON CIRCLE
MAIN CIRCLE
THIRD STREET WEST
Taxiway No. 1
Taxiway No. 2
Taxiway No. 3
Taxiway No. 4
Taxiway No. 5
Taxiway No. 6
Taxiway No. 8
Taxiway No. 9
5th Str. Gate
MAIN GATE
3rd Str. Gate
SOURCE: INSTALLATION DOCUMENTS

from water samples taken at the golf course (Women Hollow Creek) indicate that on occasion, iron has been a major inorganic constituent of these samples.

The Cibolo Creek Municipal Authority (CCMA) discharges treated wastewater to Cibilo Creek about 1-1/2 miles downstream of Randolph AFB. This CCMA treatment plant handles wastewater from the surrounding region including Randolph AFB.

THREATENED AND ENDANGERED SPECIES

A review of installation documents indicates that there are no known threatened or endangered species of plants or animals existing on Randolph AFB or its satellite facilities.

ENVIRONMENTAL SUMMARY

Geographic, geologic and hydrologic data evaluated for this study indicate the following:

- The sole source regional aquifer, the Edwards, underlies the northwest portion of Randolph AFB at a depth of 500 feet or greater.
- Randolph AFB lies within the reservoir area and not the recharge zone of the Edwards Aquifer.
- The Edwards Aquifer functions under artesian conditions and is sealed from ground surface by substantial sequences of clay, marl, and sandstone.
- A shallow water table (unconfined) aquifer has been shown to exist on base and may be in communication with local surface waters (Cibolo Creek or Women Hollow Creek) periodically. The full extent of this aquifer is unknown.
- Six inactive wells identified in the area present a potential pathway for waste migration into the Edwards Aquifer by way of deteriorating casing materials.
- Women Hollow Creek rises in the south (golf course) part of Randolph AFB.

- Base surficial soils are predominantly silts and clays that exhibit low permeabilities. More permeable, coarser-grained soils are present at ground surface in zones proximate to local surface waters.
- Annual net precipitation for the area is minus 27 inches. This condition reduces the amount of leachate generation from landfills located on Randolph AFB resulting from precipitation.
- No wetlands exist within the installation boundary.
- Natural populations of either threatened or endangered plants or animals do not exist on the base.

A potential exists for the generation and migration of waste contaminants into and through the shallow aquifer zone. Wastes disposed in areas adjacent to surface waters have been placed in the unsaturated portion of this aquifer. The aquifer is present at shallow depths and is recharged directly by precipitation and/or by communication with streams. Migrating wastes would reasonably be expected to move through the shallow aquifer and enter local streams as part of the base flow during dry periods.

From these major points it may be concluded that the potential for the generation and subsequent migration of contaminants originating from past waste disposal sites to the deep (Edwards) aquifer is not likely unless migrating wastes encounter an improperly abandoned well and follow deteriorating casing materials downward into the potable water zone (Reeves, 1981). The actual movement of contaminants into an artesian aquifer would be governed by the hydrochemical properties of the individual material.

SECTION 4
FINDINGS

This section summarizes hazardous wastes generated by installation activities, identifies disposal sites located on base, and evaluates the potential for environmental contamination. Past waste generation and disposal methods were reviewed to assess hazardous waste management at Randolph Air Force Base.

SATELLITE ANNEXES REVIEW

Seguin Auxiliary Airfield structural facilities include a fire station, control tower (runway surveillance unit) and support utilities. Water supply and sewage treatment are provided by the City of Seguin. Two fuel storage tanks exist but no leaks or spills have been reported. Solid waste generated at Seguin Auxiliary Airfield is returned to Randolph for disposal. There have been no significant past or present waste generation or disposal activities. One fire protection training area was used at Seguin and this is discussed in detail later in this section.

Canyon Lake Recreation Area includes four permanent structures, camping and picnicking facilities. A well provides water supply. Sewage is collected in holding tanks and periodically pumped for disposal off the site. Solid wastes are collected by contract and hauled to off site disposal. Four gasoline tanks at the recreation area have a history of no spills or leaks. The recreation annex has not had any significant past or present industrial waste generation or disposal activities.

BASE HAZARDOUS WASTE ACTIVITY REVIEW

A review was made of past and present base activities that resulted in generation and disposal of hazardous waste. Information was obtained from files and records, interviews with past and present base employees, and facility inspections.

It is noted that file data and interviews did not enable determination of waste handling activities prior to about 1940. From the historical descriptions of the training activities at the base, it is believed that the generation of hazardous wastes was probably small. In addition, many of the currently known hazardous chemicals were developed during and after World War II.

Hazardous waste sources at Randolph AFB are grouped into the following:

- Industrial Operations (Shops)
- Waste Accumulation and Storage Areas
- Fuels Management
- Spills and Leaks
- Pesticide Utilization
- Fire Protection Training

The following discussion addresses only those wastes generated on Randolph AFB which are either hazardous or potentially hazardous. In this discussion a hazardous substance is defined by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), except that it does not exclude materials such as waste oils and liquid fuels which are of concern for Air Force operations. A potentially hazardous waste is one which is suspected of being hazardous, although insufficient data are available to fully characterize the material.

Industrial Operations (Shops)

The industrial operations at Randolph AFB can be divided into eight main operating units as follows:

1. 12th Field Maintenance Squadron
2. SARPMA - Civil Engineering
3. 12th Transportation Division

4. 12th Air Base Group
5. 12th Organization Maintenance Squadron
6. 12th Audio Visual Services Division
7. 2015th Communications Squadron
8. Lear Seigler, Inc.

Various branches and offices exist within each operating unit, many of which use hazardous materials and/or generate hazardous wastes. A review was made of the Bioenvironmental Engineering Services (BES) shop files to identify those shops which handle hazardous wastes. The results of this file review are presented in Appendix E (Master List of Industrial Shops).

For those shops that were identified as handling hazardous material or generating hazardous waste, personnel were interviewed to obtain required information. The information obtained from base interviews and base records was used to establish a timeline of disposal methods for major wastes generated at each shop. The matrix presented in Table 4.1 shows shop and building number, shop wastes or materials used, current quantities of wastes or materials used and disposal methods.

Many waste solvents, fuels and other petroleum-based fluids were burned at the fire protection training area while others were managed through the Defense Property Disposal Office (DPDO). Many other liquid wastes have been poured into the sanitary sewers. Solid wastes and mixtures of solid and liquid wastes were disposed of at on-site and off-site landfills.

Waste Accumulation and Storage Areas

Waste materials are accumulated at many locations on Randolph AFB that fall under one of the following classifications:

1. Temporary storage at waste generation sites.
2. Less than 90-day storage at Hazardous Waste Accumulation Points (HWAP).
3. Hazardous waste accumulation areas.
4. Waste oil/fuel storage in tanks.
5. Oil-water separators.

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 1950 1960 1970 1980)
12TH FLIGHT TRAINING WING				
12TH FIELD MAINTENANCE SQUADRON				
NON-DESTRUCTIVE INSPECTION	80	PHOTOCHEMICALS	132 GALS./YR.	SANITARY SEWER, DPDO
		PHOTO FIXERS	132 GALS./YR.	SILVER RECOVERY DPDO
		PD-680 (STODDARD SOLVENT)	100 GALS./YR.	SANITARY SEWER, DPDO
		ISOSPAR-M	100 GALS./YR.	DPDO
CORROSION CONTROL	H-48	PAINT STRIPPER AND RESIDUE	2750 GALS./YR.	LANDFILL, OFF-BASE LANDFILL, DPDO
		TOLUENE	5 GALS./YR.	SANITARY SEWER
		METHYL ETHYL KETONE (MEK)	5500 GALS./YR.	SANITARY SEWER, DPDO SANITARY SEWER
	230	PAINT STRIPPER AND RESIDUE	275 GALS./YR.	SANITARY SEWER, DPDO
		METHYL ETHYL KETONE AND MISCELLANEOUS SOLVENTS	600 GALS./YR.	EVAPORATION/SANITARY SEWER
BATTERY SHOP	241	ACID (NEUTRALIZED)	120 GALS./YR.	NEUTRALIZED TO SANITARY SEWER
		MEK	<12 GALS./YR.	EVAPORATION
		BATTERY CASES	AS REQUIRED	DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 1950 1960 1970 1980)
METAL CLEANING	241	CARBON REMOVER	30 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR* → DPDO
		CORROSION REMOVER	30 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR* → DPDO
		SODIUM HYDROXIDE	60 LBS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		SODIUM CARBONATE	60 LBS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		POTASSIUM PERMANGANATE	60 LBS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		PHOSPHORIC ACID	18 LBS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		TRICHLOROETHYLENE	12 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		STRIPPER	165 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*
		PD-680 (STODDARD SOLVENT)	12 GALS./YR.	SANITARY SEWER → OIL WATER SEPARATOR*
		SLUDGE	275 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR* → DPDO
MACHINE SHOP	241	PD-680 (STODDARD SOLVENT)	12 GALS./YR.	SANITARY SEWER → DPDO
		SOLVENTS AND OILS	24 GALS./YR.	SANITARY SEWER → DPDO

*PASSING THROUGH THE OIL/WATER SEPARATOR TO THE SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
ACCESSORY REPAIR	H-76	CARBON REMOVER	500 GALS./YR.	DPDO
		CORROSION REMOVER	500 GALS./YR.	DPDO
		SODIUM HYDROXIDE	1200 LBS./YR.	DPDO
		PD-680 (STODDARD SOLVENT)	660 GALS./YR.	DPDO
		TRICHLOROETHYLENE	12 GALS./YR.	DPDO
ENGINE TEST CELL	85	JP-4 (STODDARD SOLVENT)	550 GALS./YR.	DPDO/FPTA
		PETROLEUM SOLVENTS	55 GALS./YR.	DPDO
AEROSPACE GROUND EQUIPMENT	H-16	PD-680	110 GALS./YR.	OFF-BASE CONTRACTOR FPTA; DPDO
		SOLVENTS	1300 GALS./YR.	OFF-BASE CONTRACTOR FPTA; DPDO
		HYDRAULIC FLUID	660 GALS./YR.	OFF-BASE CONTRACTOR/FPTA; DPDO
ELECTRICAL REPAIR	241	TRICHLOROETHYLENE	220 GALS./YR.	SANITARY SEWER; DPDO
ENVIRONMENTAL SYSTEMS	241	PD-680 (STODDARD SOLVENT)	25 GALS./YR.	DPDO
WHEEL AND TIRE SHOP	241	PD-680 (STODDARD SOLVENT)	600 GALS./YR.	DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
PNEUDRAULICS SHOP	241	SOLVENT	500 GALS./YR.	SANITARY SEWER ---→ DPDO/ OFF-BASE CONTRACTOR ——→
		PD-680 (STODDARD SOLVENT)	300 GALS./YR.	SANITARY SEWER ---→ DPDO/ OFF-BASE CONTRACTOR ——→
FUEL SYSTEM REPAIR	H-44	MEK	5 GALS./YR.	EVAPORATION
		CALIBRATION OIL	165 GALS./YR.	OFF-BASE CONTRACTOR/DPDO
		WASTE FUELS (JP-4)	110 GALS./YR.	EVAPORATION
PMEL	H-63	SOLVENTS	1 GAL./YR.	DPDO
		MERCURY	1 PINT/YR.	DPDO
		OILS	AS REQUIRED	DPDO
		ELECTRON TUBES	AS REQUIRED	OFF-BASE LANDFILL
12TH TRAINING FABRICATION DIVISION	H-74 (#891 PREV. TO 1980)	THINNERS AND PAINT RESIDUES	300 GALS./YR.	FPTA/DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)
INDUSTRIAL OPERATIONS (Shops)
Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
12TH TRANSPORTATION DIVISION				
VEHICLE MAINTENANCE	1048	FUEL OIL AND HYDRAULIC FLUID	1300 GALS./YR.	FPTA DPDO
BATTERY SHOP	1048	BATTERY CASES	300 CASES/YR.	DPDO
		ELECTROLYTE (NEUTRALIZED)	225 GALS./YR.	NEUTRALIZED TO SANITARY SEWER
PAINT AND BODY SHOP	208	THINNER AND PAINT RESIDUE	660 GALS./YR.	DPDO
FIRE TRUCK MAINTENANCE	700	PD-680 (STODDARD SOLVENT)	550 GALS./YR.	OFF-BASE CONTRACTOR/DPDO
REFUELING MAINTENANCE	H-22	OIL AND HYDRAULIC FLUID	1300 GALS./YR.	DPDO/OFF-BASE CONTRACTOR
		WASTE FUELS	330 GALS./YR.	SANITARY SEWER/OFF-BASE CONTRACTORS
		MISCELLANEOUS GREASES	<10 LBS./YR.	LANDFILL; OFF-BASE LANDFILL
		JP-4 PURGED	<250 GALS./YR.	SANITARY SEWER; OIL-WATER SEPARATOR*
		JP-4	1050 GALS./YR.	FPTA/DPDO
USAF CLINIC RANDOLPH				
MEDICAL X-RAY	675	PHOTOCHEMICALS	960 GALS./YR.	SANITARY SEWER
		PHOTOFIXER	960 GALS./YR.	SANITARY SEWER; DPDO SILVER RECOVERY

* PASSING THROUGH THE OIL/WATER SEPARATOR TO THE SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 1950 1960 1970 1980)
DENTAL X-RAY AND LABORATORY	902	PHOTOCHEMICALS	200 GALS./YR.	SANITARY SEWER
		PHOTOFIXERS	200 GALS./YR.	SANITARY SEWER → DPDO SILVER RECOVERY
		ALCOHOLS	<40 GALS./YR.	SANITARY SEWER
12TH AIR BASE GROUP				
PHOTO HOBBY SHOP	895	PHOTOCHEMICALS	100 GALS./YR.	SANITARY SEWER
		PHOTOFIXERS	100 GALS./YR.	SANITARY SEWER → BASE PHOTO FOR SILVER RECOVERY
AUTO HOBBY SHOP	896	PD-680 (STODDARD SOLVENT)	600 GALS./YR.	SANITARY SEWER → DPDO
		WASTE OILS	3000 GALS./YR.	DPDO
REPRODUCTION	220	TONER	18 GALS./YR.	SANITARY SEWER
		DISPERSANT	18 GALS./YR.	SANITARY SEWER
		METHYLENE CHLORIDE	12 GALS./YR.	SANITARY SEWER
		BLANKET WASH	85 GALS./YR.	SANITARY SEWER
AIRCRAFT WASHRACKS	H-6, H-16, H-75	PD-680 (STODDARD SOLVENT)	1300 GALS./YR.	SANITARY SEWER → OIL/WATER SEPARATOR*

* PASSING THROUGH THE OIL/WATER SEPARATOR TO THE SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 1950 1960 1980)
12TH AUDIO VISUAL SERVICES DIVISION				
VISUAL AIDS	H-6	NAPTHA	50 GALS./YR.	EVAPORATION/LANDFILL
		ACETIC ACID	60 GALS./YR.	SANITARY SEWER
		PAINTS/THINNERS	100 GALS./YR.	EVAPORATION/LANDFILL
PHOTO LAB	156	PHOTOCHEMICALS	100 GALS./YR.	SANITARY SEWER
		PHOTOFIXERS		SANITARY SEWER → DPDO SILVER RECOVERY
2015 COMMUNICATIONS SQUADRON				
RADAR COMMUNICATION AND RADIO MAINTENANCE	2015	ELECTRON TUBES	60 TUBES/YR.	LANDFILL → OFF-BASE LANDFILL → BASE SUPPLY → OFF-BASE LANDFILL
NAVAIDS MAINTENANCE	740	ELECTRON TUBES	60 TUBES/YR.	DISPOSAL PIT AT ON-BASE RADIOACTIVE BURIAL GROUNDS → BASE SUPPLY → OFF-BASE LANDFILL
TENANT ORGANIZATIONS				
SARPMA				
PROTECTIVE COATING	H-62	WASTE THINNER	700 GALS./YR.	LANDFILL → OFF-BASE LANDFILL → DPDO
		WASTE PAINT	700 GALS./YR.	LANDFILL → OFF-BASE LANDFILL → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE/MATERIAL	CURRENT QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
POWER PRODUCTION	H-62	BATTERY CASES	30 CASES/YR.	DPDO
		TRANSFORMER OIL	3000 GALS./YR.	LANDFILL/OFF-BASE CONTRACTORS; OFF-BASE LANDFILL/OFF-BASE CONTRACTORS; DPDO
		NEUTRALIZED BATTERY SOLUTION	100 GALS./YR.	NEUTRALIZED TO SANITARY SEWER
ENTOMOLOGY	1050	SPRAYER RINSEWATER	240 GALS./YR.	STORM SEWER; RE-USE
LIQUID FUELS	41101, 41106	LIQUID FUEL TANK 41101 AND 41106 SLUDGES	600 GALS./ EVERY 5 YRS.	ON GROUND WITHIN BERMS; DPDO
LEAR SIEGLER, INC.				
AIRCRAFT PAINTING AND STRIPPING OPERATIONS	H-41, H-42, H-47	PAINT STRIPPER AND RESIDUE	2,750 GALS./YR.	DPDO
		TOLUENE	5 GALS./YR.	SANITARY SEWER
		METHYL ETHYL KETONE (MEK)	5,500 GALS./YR.	DPDO/ SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

Numerous temporary storage sites exist on base, as summarized in the Randolph AFB (RAFB) Plan 708 (Management of Hazardous Wastes). These small-volume generators accumulate wastes in 5- to 55-gallon containers which are transferred to the HWAP's when filled.

There are 18 HWAP locations (Figure 4.1) that store recoverable, waste fuels and hazardous materials. Eight of these accumulation points are used as contractor pick-up points, also indicated in Figure 4.1. The No. 17 site at Building No. 1285 is a storage facility where PCB's are stored before DPDO pickup. For the past five years, the No. 17 site has also served as a temporary storage site for hazardous materials before they are used by the shops.

The above method of waste accumulation on the base was initiated in the last several years. Previously, wastes were kept at the generating site prior to disposal or sometimes moved to various central storage areas awaiting pick-up.

Most of the 18 on-base waste accumulation areas are dedicated to the accumulation of spent petroleum liquids including miscellaneous oils, fluids and JP-4. Those areas indicated in Figure 4.1 represent areas where waste oils and other materials are initially accumulated at the present time. Table 4.2 lists the sites shown in Figure 4.1. Eight of these areas are now utilized as points of contractor pick-up and serve as accumulation points for nearby temporary storage sites.

Exterior accumulation points are not uniform in design. They vary from sites having cement pads, dikes and shelter to sites having only gravel pads and no shelter. No major spills or fires were reported from these sites.

Some spill incidents were noted at the hazardous materials storage area near Building No. 1285. This site, which has no shelter, is reported to periodically spray contents from the storage barrels onto adjacent areas (gravel and bare ground). This spraying was caused by pressure induced from the heating of the sun. The number and quantity of uncontrolled releases, however, could not be estimated.

Fuels Management

The Randolph AFB Fuels Management storage system consists of over 100 storage tanks located throughout the base. A description of all known diesel fuel, aviation gas, automobile gas, jet fuel, fuel oil,

FIGURE 4.1

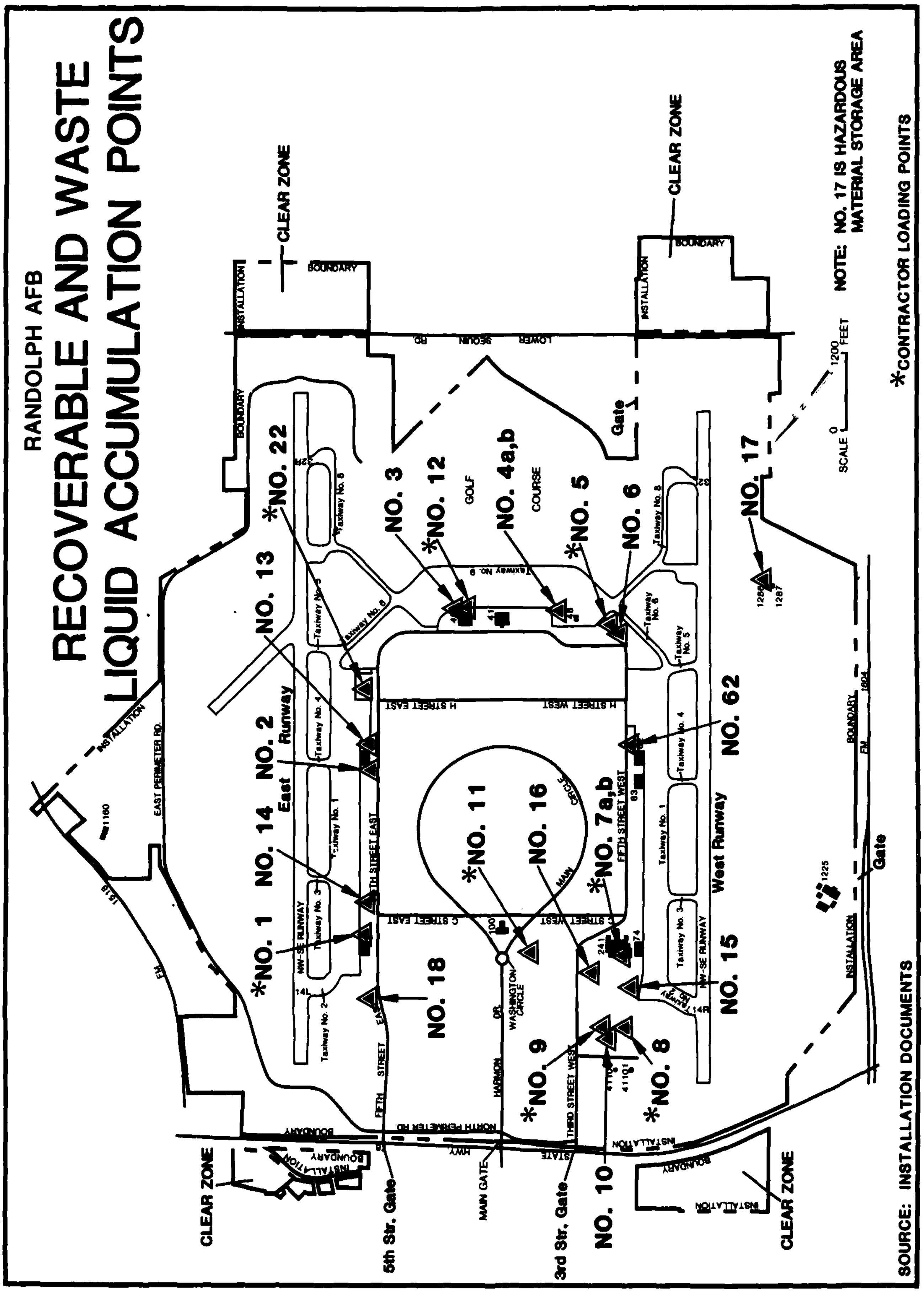

RANDOLPH AFB
RECOVERABLE AND WASTE
LIQUID ACCUMULATION POINTS
*NO. 1
NO. 2
NO. 3
NO. 4a,b
*NO. 5
NO. 6
*NO. 7a,b
NO. 8
*NO. 9
NO. 10
*NO. 11
*NO. 12
NO. 13
NO. 14
NO. 15
NO. 16
NO. 17
NO. 18
*NO. 22
NO. 62
East Runway
West Runway
GOLF
COURSE
CLEAR ZONE
INSTALLATION
BOUNDARY
LOWER SEGUIN RD.
EAST PERIMETER RD.
NORTH PERIMETER RD.
FIFTH STREET EAST
FIFTH STREET WEST
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
THIRD STREET WEST
HARMON DR.
WASHINGTON CIRCLE
MAIN CIRCLE
STATE HWY.
FM 1518
FM 1604
5th Str. Gate
MAIN GATE
3rd Str. Gate
Gate
NW-SE RUNWAY
Taxiway No. 1
Taxiway No. 2
Taxiway No. 3
Taxiway No. 4
Taxiway No. 5
Taxiway No. 6
Taxiway No. 8
Taxiway No. 9
14L
14R
32L
32R
SCALE 0 1200 FEET
NOTE: NO. 17 IS HAZARDOUS MATERIAL STORAGE AREA
*CONTRACTOR LOADING POINTS
SOURCE: INSTALLATION DOCUMENTS

TABLE 4.2
HAZARDOUS, RECOVERABLE AND WASTE LIQUID ACCUMULATION POINTS*

No. 1	Spent hydraulic fluid, lubricating oils, and contaminated jet fuel (140 gal/mo total), also contractor pick-up point.
No. 2	Spent hydraulic fluid, lubricating oils and contaminated jet fuels (70 gal/mo total).
No. 3	Industrial waste separator, mixed petroleum wastes (20 gal/mo).
No. 4	Spent hydraulic fluid, lubricating oils, and contaminated jet fuel (140 gal/mo total).
No. 5	Spent lubricating oils (660 gal/mo), also contractor pick-up point.
No. 6	Industrial waste separator, No. 895 mixed petroleum waste (20 gal/mo).
No. 7	Used hydraulic fluid, lubricating oils and contaminated jet fuel (40 gal/mo) also contractor pick-up point.
No. 8	Lubricating oils (35 gal/mo) also contractor pick-up point.
No. 9	Lubricating oils and hydraulic fluids (100 gal/mo total) also contractor pick-up point.
No. 10	Industrial waste separator No. 1046, mixed petroleum waste (20 gal/mo) also contractor pick-up point.
No. 11	Spent lubricating oils and hydraulic fluid (100 gal/mo total).
No. 12	Spent lubricating oils (25 gal/mo).
No. 13	Industrial waste separator No. 11653, mixed petroleum waste (20 gal/mo), also contractor pick-up point.
No. 14	Industrial waste separators No. 11650, mixed petroleum waste (5 gal/mo), also contractor pick-up point.
No. 15	Contaminated jet fuel (40 gal/mo).
No. 16	Waste motor oils in underground tank (no longer in use).
No. 17	Spent lubricating oil (20 gal/mo), transformer storage; hazardous material storage area.
No. 18	Contaminated jet fuel (10 gal/mo).

*See Figure 4.1 for location of these points.
Source: Installation Documents.

lubricating oil and spent petroleum waste tanks is presented in Table 4.3. As indicated by base records, a number of tanks are inactive. Inactive tanks contain either water, air or caustic (used as a preservative) as indicated in Table 4.3.

All bulk fuels are transported onto the base in tank trucks; no fuels are transferred by pipelines crossing base boundaries. In the past, railroad cars were used to transport bulk fuels. Two internal fuel pipelines do exist however. These lines currently transport fuel from the large bulk storage facilities (No. 41101 and 41106) to the east and west flight lines areas.

Fuel storage tanks are inspected on a monthly basis. An interval of 3 to 5 years is typical for cleaning of most tanks. A minimum amount of sludge is generated in most tanks and it is removed by wastage to ground, storm or sanitary sewers. Sludge generated by large bulk fuel storage facilities (No. 41101 and 41106) was placed in the bermed area (Figure 4.2) adjacent to tanks for drying until about 1978. Existing policy now calls for drumming of this waste for off-site disposal. Two tanks have been suspected of leaking; an old FPTA tank and Tank T-16. These tanks are discussed in the following subsection.

Spills and Leaks

Base records and interviews with present and past personnel indicate no major spills and leaks of pesticides, fuels, oils, chemicals and other hazardous materials has occurred since the 1950s. Base records kept since 1976 indicate only minor spills and leaks have occurred. These spills were either allowed to evaporate, picked up using absorbent pads by SARPMA or the fire department, or washed down sanitary or storm sewers with eventual discharge to Cibolo Creek.

In 1979, the oil-water separator for the Cibolo Creek storm drain was damaged and removed. This, in effect, now provides less protection for Cibolo Creek in the event of a major spill or leak. A 200 gallon spill of JP-4 fuel was reported in July of 1976. The spill occurred while construction for relocating a fuel transfer line was taking place near Facility 1011. As the line was purged, approximately 200 gallons of JP-4 were lost, first filling the construction pit, then overflowing to Cibolo Creek. A fish kill resulted in the creek. The report on file in the BES office did not contain estimates on how much JP-4 overflowed

TABLE 4.3
LIST OF TANKS

Location By Bldg. No.	Designation	Size of Tank (gallons)	Tank Location Above Ground	Tank Location Below Ground	Contents/Remarks
Bldg. 14	TF-14	350		X	Diesel; Age, 18 yrs
Bldg. 21	-	6,000	X		JP-4; Mobil
	-	1,200	X		Mogas; Mobil
	-	1,200	X		Diesel; Mobil
Bldg. 25	TF-25	100		X	Diesel; Age, 26 yrs
Bldg. 27	TF-27	1,000		X	Diesel; Age, 16 yrs
Bldg. 35	TF-35	1,500		X	Caustic Soda and Water; Previously JP-4; Age, 13 yrs
Bldg. 48	TF-48	25,000		X	Paint Residue
Bldg. 50	TF-50	1,000		X	Diesel
Bldg. 54	TF-54	560		X	Diesel; Age, 9 yrs
Bldg. 62	-	20	X		Gas
	-	20	X		Diesel
Bldg. 66	TF-66	284		X	Diesel, Age, 20 yrs
Bldg. 85	TF-85	4,000	X		JP-4; Age, 4 yrs
Bldg. 100	-	20	X		Diesel
Bldg. 178-179	TF-12416A	10,000		X	Mogas - Regular; Age, 18 yrs
	TF-12416B	10,000		X	Mogas - Unleaded; Age, 5 yrs
	TF-12417	10,000		X	Diesel; Age, 18 yrs
Bldg. 234	-	110	X		Diesel
Bldg. 379	TF-379	2,000		X	Diesel; Age, 25 yrs
Bldg. 497	TF-497	24,000		X	Diesel
Bldg. 499	TF-499	400		X	Diesel; Age, 10 yrs
	-	20	X		Mogas

TABLE 4.3 (Continued)
LIST OF TANKS

Location By Bldg. No.	Designation	Size of Tank (gallons)	Tank Location		Contents/Remarks
			Above Ground	Below Ground	
Bldg. 675A	TF-675A	400		X	Caustic Soda and Water; Previously Mogas; Age 27 yrs
675B	TF-675B	200		X	Caustic Soda and Water; Previously Diesel
Bldg. 704	TF-704	150		X	Diesel; Age, 12 yrs
Bldg. 738	TF-738	100	X		Diesel; Age, 1 yr
Bldg. 740A	TF-740A	1,000		X	Diesel; Age, 6 yrs
740B	TF-740B	1,200		X	Diesel; Age, 6 yrs
Bldg. 759	TF-759	180		X	Diesel; Age, 11 yrs
Bldg. 875	TF-875	250		X	Sanded In-place; Previously Diesel; Age, 6 yrs
Bldg. 904	TF-904	575	X		Diesel; Age, 18 yrs
Bldg. 991	TF-991	650	X		Diesel
Bldg. 1010	TF-1010	60		X	Diesel; Age, 21 yrs
Bldg. 1011	T-28	52,580		X	JP-4; Age, 47 yrs
	T-29	52,580		X	JP-4; Age, 47 yrs
	T-30	52,580		X	JP-4; Age, 47 yrs
	T-31	52,580		X	JP-4; Age, 47 yrs
	T-32	52,580		X	JP-4; Age, 47 yrs
	T-33	52,580		X	JP-4; Age, 47 yrs
	T-34	52,580		X	JP-4; Age, 47 yrs
	T-35	52,580		X	JP-4; Age, 47 yrs
	T-36	52,580		X	JP-4; Age, 47 yrs
	T-37	52,580		X	JP-4; Age, 47 yrs
Bldg. 1042	TF-41101	840,000	X		JP-4; Age, 28 yrs
	TF-41106	420,000	X		JP-4; Age, 28 yrs
Bldg. 1046 (1051)	(1051)	500	X		Mogas

TABLE 4.3 (Continued)
LIST OF TANKS

Location By Bldg. No.	Designation	Size of Tank (gallons)	Tank Location Above Ground	Tank Location Below Ground	Contents/Remarks
Bldg. 1047	T-22	52,580		X	JP-4; Age, 47 yrs
	T-23	52,580		X	JP-4; Age, 47 yrs
Bldg. 1070	TF-1070	10,000		X	Mogas
	TF-1070	10,000		X	Mogas
	TF-1070	10,000		X	Mogas
	TF-1070	10,000		X	Mogas
Bldg. 1120	TF-1120	275		X	Diesel; Age, 21 yrs
Bldg. 1123	TF-1123	300	X		Diesel
Bldg. 1130	TF-1130	60	X		Diesel; Age, 20 yrs
Bldg. 1175	-	5,000	X		JP-4 (FPT)
Bldg. 1178	TF-1178	1,000		X	Diesel; Age, 5 yrs
Bldg. 1179	TF-1179	300		X	Diesel
Bldg. 1200	TF-1200	500		X	Diesel
Bldg. 1207	TF-1207	300		X	Diesel
Bldg. 1220	TF-1220	300		X	Diesel
Bldg. 1227	TF-1277	300		X	Diesel
Bldg. 1278	TF-1278	275		X	Diesel
Bldg. 1279	TF-1279	275		X	Diesel
Bldg. 1280	TF-1280	300		X	Diesel
Bldg. 1286	TF-1286	5,000	Removed		Previously Held Mogas; Moved to FPTA No. 2 and Now Contains Waste JP-4
Bldg. 1290	-	300		X	Diesel
Bldg. 1295	-	300		X	Diesel
Bldg. 1350	TF-1350	500		X	Diesel

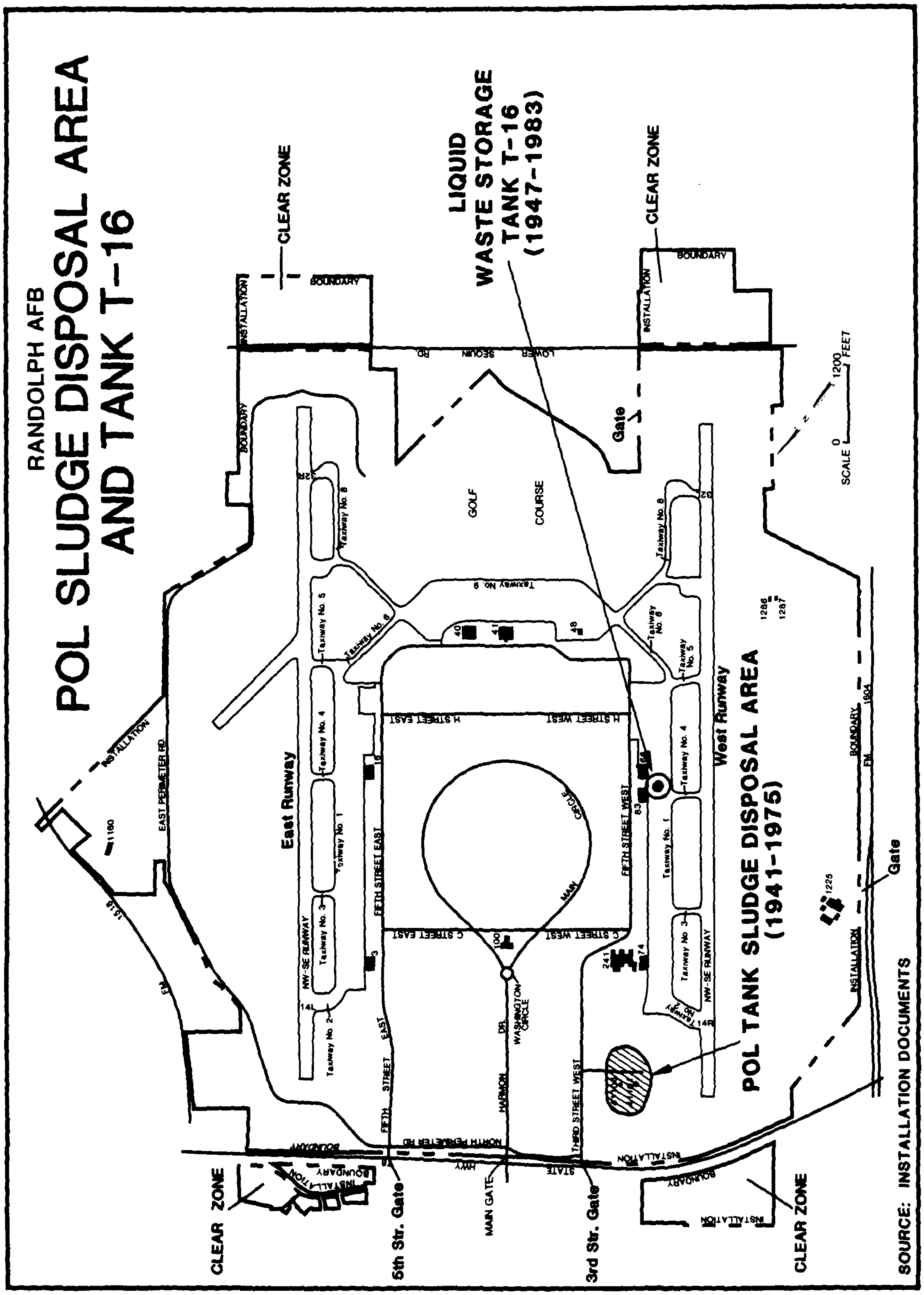
TABLE 4.3 (Continued)
LIST OF TANKS

Location By Bldg. No.	Designation	Size of Tank (gallons)	Tank Location Above Ground	Tank Location Below Ground	Contents/Remarks
Bldg. 2501	-	110		X	Diesel
Bldg. 11641 (near H-3)	TF-11641	8,000	X		Empty, Previously Held Ethylene Glycol and Water
Bldg. 12415	T-24	52,580	X		Caustic Soda and Water; Previously Jet Fuel; Age 47 yrs
	T-25	52,580	X		Caustic Soda and Water; Previously Jet Fuel; Age 47 yrs
	T-26	52,580	X		Caustic Soda and Water; Previously Jet Fuel; Age 47 yrs
	T-27	52,580	X		Caustic Soda and Water; Previously Jet Fuel; Age 47 yrs
GCA	TF-13405	260	X		Diesel; Age 11 yrs
TV	TF-13408	375		X	Diesel
AN/GMQ10	TF-14101	275		X	Diesel
Bldg. 15038	TF-15038	1,500	X		Oil; Inactive; Age, 26 yrs
Hangar 4	TF-4	25,000		X	Caustic Soda and Water
Hangar 13	TF-13	25,000		X	Caustic Soda and Water
Hangar 40	-	10,000		X	AVGAS
Hangar 63	T-16 (TF-3072)	25,000		X	Empty Except Sludge from Former Use as Waste Oil Tank; Age, 43 yrs
Hangar 73	TF-73	25,000		X	Caustic Soda and Water

TABLE 4.3 (Continued)
LIST OF TANKS

Location By Bldg. No.	Designation	Size of Tank (gallons)	Tank Location Above Ground	Tank Location Below Ground	Contents/Remarks
Canyon Lake	CT-1	1,000	X		Mogas; Age, 10 yrs
	CT-2	450	X		Mogas; Age, 10 yrs
	CT-3	515	X		Mogas; Age, 10 yrs
	CT-4	500	X		Mogas
Seguin Airfield	ST-1	500	X		Mogas
	ST-2	200	X		Diesel

Source: Installation Documents


RANDOLPH AFB
POL SLUDGE DISPOSAL AREA
AND TANK T-16
LIQUID
WASTE STORAGE
TANK T-16
(1947-1983)
POL TANK SLUDGE DISPOSAL AREA
(1941-1975)
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
INSTALLATION
BOUNDARY
LOWER SEGUIN RD
GOLF
COURSE
Gate
Gate
SCALE
0
1200
FEET
East Runway
West Runway
NW-SE RUNWAY
Taxiway No. 1
Taxiway No. 2
Taxiway No. 3
Taxiway No. 4
Taxiway No. 5
Taxiway No. 6
Taxiway No. 8
Taxiway No. 9
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
FIFTH STREET EAST
FIFTH STREET WEST
MAIN CIRCLE
WASHINGTON CIRCLE
HARMON DR.
THIRD STREET WEST
NORTH PERIMETER RD
EAST PERIMETER RD
STATE HWY
FM 1518
FM 1604
5th Str. Gate
MAIN GATE
3rd Str. Gate
SOURCE: INSTALLATION DOCUMENTS

into the creek or how much of the fuel saturated the construction pit soils.

As noted previously, leaks from drums in storage areas without shelters have occurred. These spills have resulted from overheating of barrels or from rain leaking into barrels causing the oil to float out. It was noted that at least as recently as 1983, storage areas near Buildings No. 22, 62, 245, 1287 and 47 and 48 have unsealed expansion joints. These unsealed joints allow any spillage to percolate into the subsoil below the concrete slabs.

Tank T-16, located at Hangar No. 63, is a steel 25,000 gallon tank installed below ground in 1942. This tank was used as a part of the aircraft fueling system until 1945 to 1946 when it was decommissioned. At some later year this tank was then used to store waste POL products. The years this tank was used or the types of materials held was not verified from base records or interviewees. This tank is suspected of leakage, but tests have not been conclusive in this regard. Figure 4.2 shows the location of Tank T-16.

An old 1,700 gallon storage tank at the fire protection training area leaked at the site and was subsequently replaced several years ago.

Pesticide Utilization

Pesticides have been used at Randolph AFB for controlling weeds, insects, rodents and fungus. Appendix D lists the pesticides currently used at the base. Personnel from Entomology mix most of the pesticides used on base inside and/or adjacent to Building 1050, but the golf course employees also mix some. Pesticide mixing also occurred in past years between the BX and commissary but this area is now under concrete. All pesticide containers have been triple rinsed since about 1978. The container rinsewater has been put back into sprayers for dilution water. Empty containers were punctured and disposed at the landfills used by the base. Residual pesticide in the spray equipment is used by the applicator at various areas where the material is being applied. Sprayers are rinsed at random locations on the base with the rinsewater often drained out along fence lines.

Fire Protection Training

Randolph AFB

Randolph AFB has had a long history of fire training activities. For several years in the 1940's, a fire pit in the present golf area was utilized. The location of this fire protection training area (FPTA) No. 1 is shown approximately in Figure 4.3. The FPTA No. 1 area was disturbed extensively when the golf course was constructed. In the late 1940's, fire protection training was moved to the general area that it exists now but not exactly at the same site. This FPTA No. 2, located near the eastern installation boundary, has been used regularly since the 1950's with the exception of a brief interruption in about 1957 to 1958 when some training was conducted on top of a closed landfill (Landfill No. 2 discussed later). The training at the landfill site (FPTA No. 3, Figure 4.3) only lasted a short period of time (1-2 years).

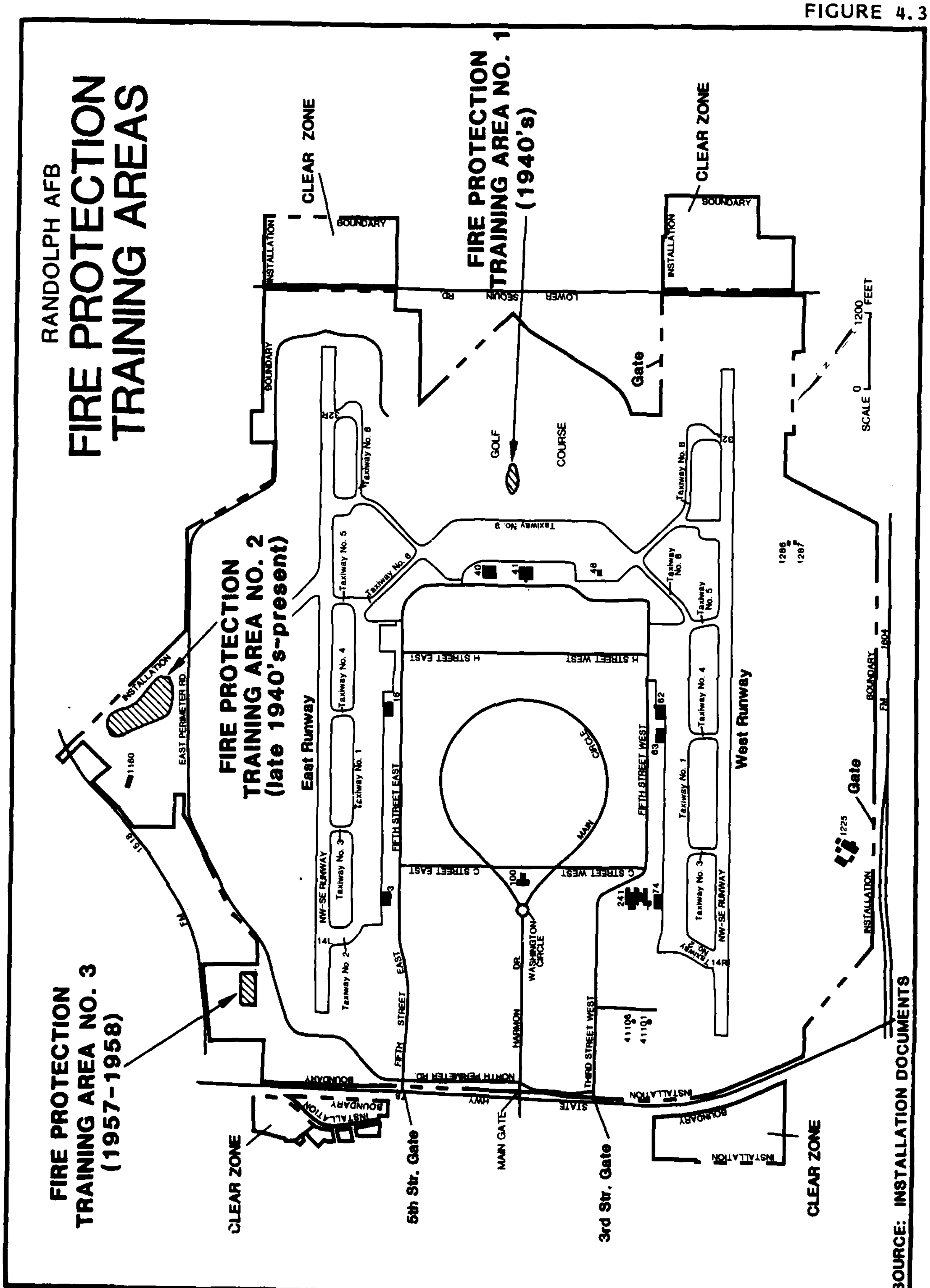
In the 1940's and 1950's, the three fire protection training areas burned fuels, thinners, solvents, petroleum oils, banana oil, and other waste fluids. In the 1960's, cleaner fuels began to be used and burning of waste fluids declined.

In the 1940's and 1950's, the number of fires for training purposes ranged from one to three per week at FPTA Nos. 1, 2 and 3. Drums of waste were brought to the fire pit area and up to 500 gallons per fire was the normal quantity used. The waste fluids were applied to the ground without pre-wetting with water.

From about 1956 to 1972, FPTA No. 2 had three "mockup aircraft" including a helicopter. One fire per week was ignited at the helicopter during this period and the frequency at the other fire pits was less. In 1972, the helicopter fire protection training activities ceased. The number of training fires from 1972 to the present have averaged approximately 16 per year.

From the mid-1960's to the present, about 300 gallons of fuel have been used per fire at FPTA No. 2. Contaminated jet fuels have predominately been used from the mid-1960's. The fire pit ground was prewetted with water at two of the mockups but the helicopter mockup pit was not.

FIGURE 4.3



RANDOLPH AFB
FIRE PROTECTION TRAINING AREAS
FIRE PROTECTION TRAINING AREA NO. 1 (1940's)
FIRE PROTECTION TRAINING AREA NO. 2 (late 1940's-present)
FIRE PROTECTION TRAINING AREA NO. 3 (1957-1958)
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
INSTALLATION BOUNDARY
LOWER SEGUIN RD.
GOLF COURSE
Gate
Gate
East Runway
West Runway
NW-SE RUNWAY
NW-SE RUNWAY
Taxiway No. 1
Taxiway No. 2
Taxiway No. 3
Taxiway No. 4
Taxiway No. 5
Taxiway No. 6
Taxiway No. 8
Taxiway No. 9
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
FIFTH STREET EAST
FIFTH STREET WEST
THIRD STREET WEST
MAIN CIRCLE
WASHINGTON CIRCLE
HARMON DR.
NORTH PERIMETER RD.
EAST PERIMETER RD.
FM 1518
FM 1604
STATE HWY
MAIN GATE
5th Str. Gate
3rd Str. Gate
SCALE 0 1200 FEET
N
SOURCE: INSTALLATION DOCUMENTS

Fire extinguishing agents used from the 1960's until the early 1970's were protein foam and chlorobromomethane. Since the early 1970's, aqueous film forming foam (AFFF); halon and dry chemicals have been used.

The soil fire pits at FPTA No. 2 were just reconstructed in 1984 to provide concrete structures filled with gravel. Drains connect the burning structures to an open holding structure for unburned fuel and extinguishing agents. Some soil from the previous pits was reportedly hauled to off-base locations during the recent construction activities. Appendix F contains photographs of some of the fire protection training areas.

Seguin Auxiliary Airfield

A fire pit exists at Seguin Auxiliary Airfield which was used in previous years by firemen at the installation (Figure 4.4 and Appendix F photograph). The fire training activities at Seguin are believed to have been for a few years from the late 1960's to the early 1970's. Fire training activities reportedly were rather irregular at the installation. The frequency of fires at Seguin was much less than at Randolph AFB with an estimated frequency of two or three per year at Seguin.

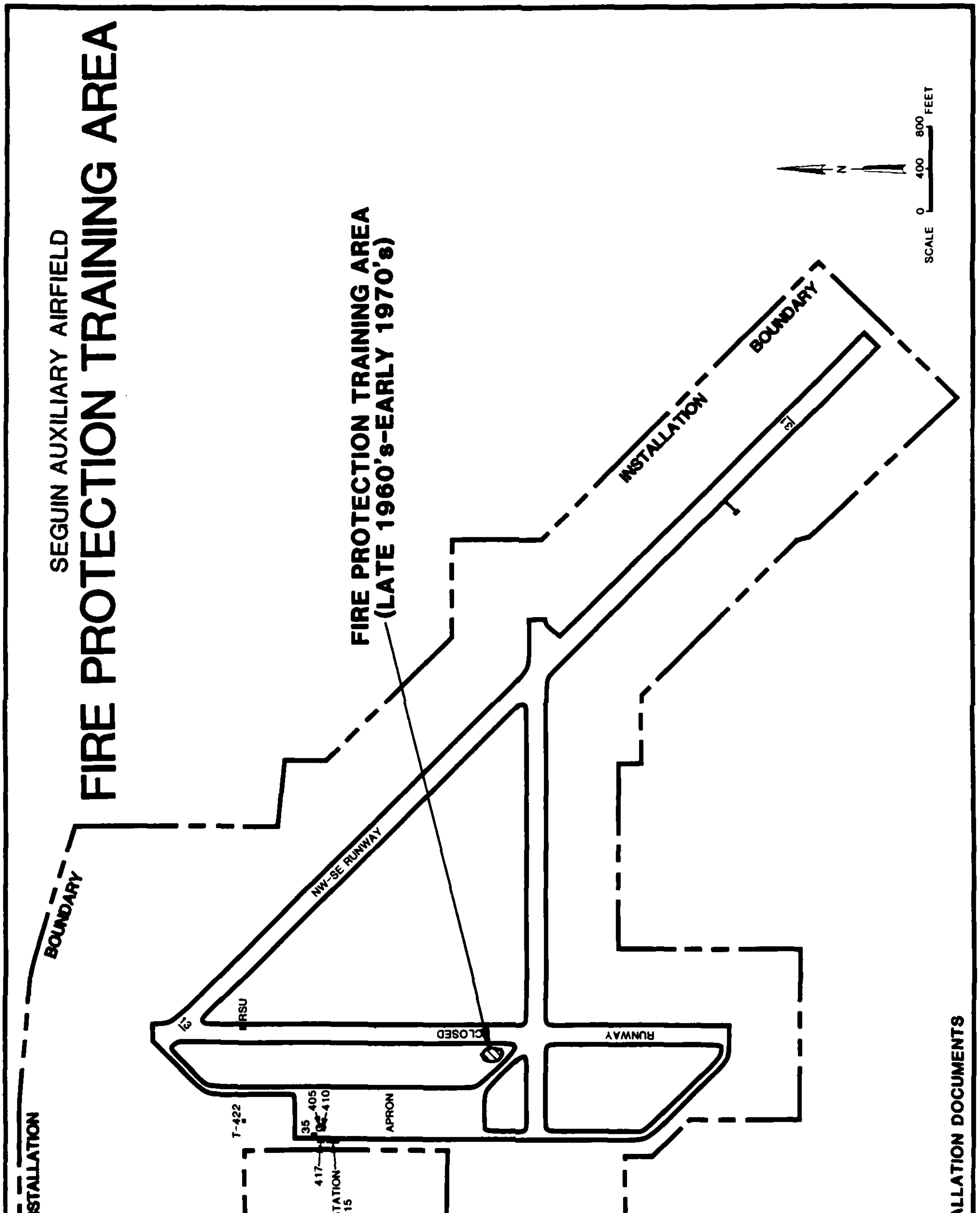
The fuels used for igniting fires for training purposes are believed to have been predominately contaminated fuels rather than other waste fluids. Burning took place in a pit constructed on soil between two taxiways at Seguin. Approximately 300 gallons of fuel is estimated to have been used for each training fire. No prewetting of the soil prior to burning occurred.

BASE WASTE DISPOSAL METHODS

The facilities at Randolph AFB which have been used for management and disposal of waste are as follows:

- o Landfills
- o Hardfills
- o Medical Sanitary Area
- o Low-Level Radioactive Material Disposal Site

FIGURE 4.4


SEGUIN AUXILIARY AIRFIELD
FIRE PROTECTION TRAINING AREA
FIRE PROTECTION TRAINING AREA
(LATE 1960's-EARLY 1970's)
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
NW-SE RUNWAY
RSU
CLOSED
RUNWAY
APRON
T-422
35
405
410
417
FIRE STATION 415
SCALE
0
400
800
FEET
N
SOURCE: INSTALLATION DOCUMENTS

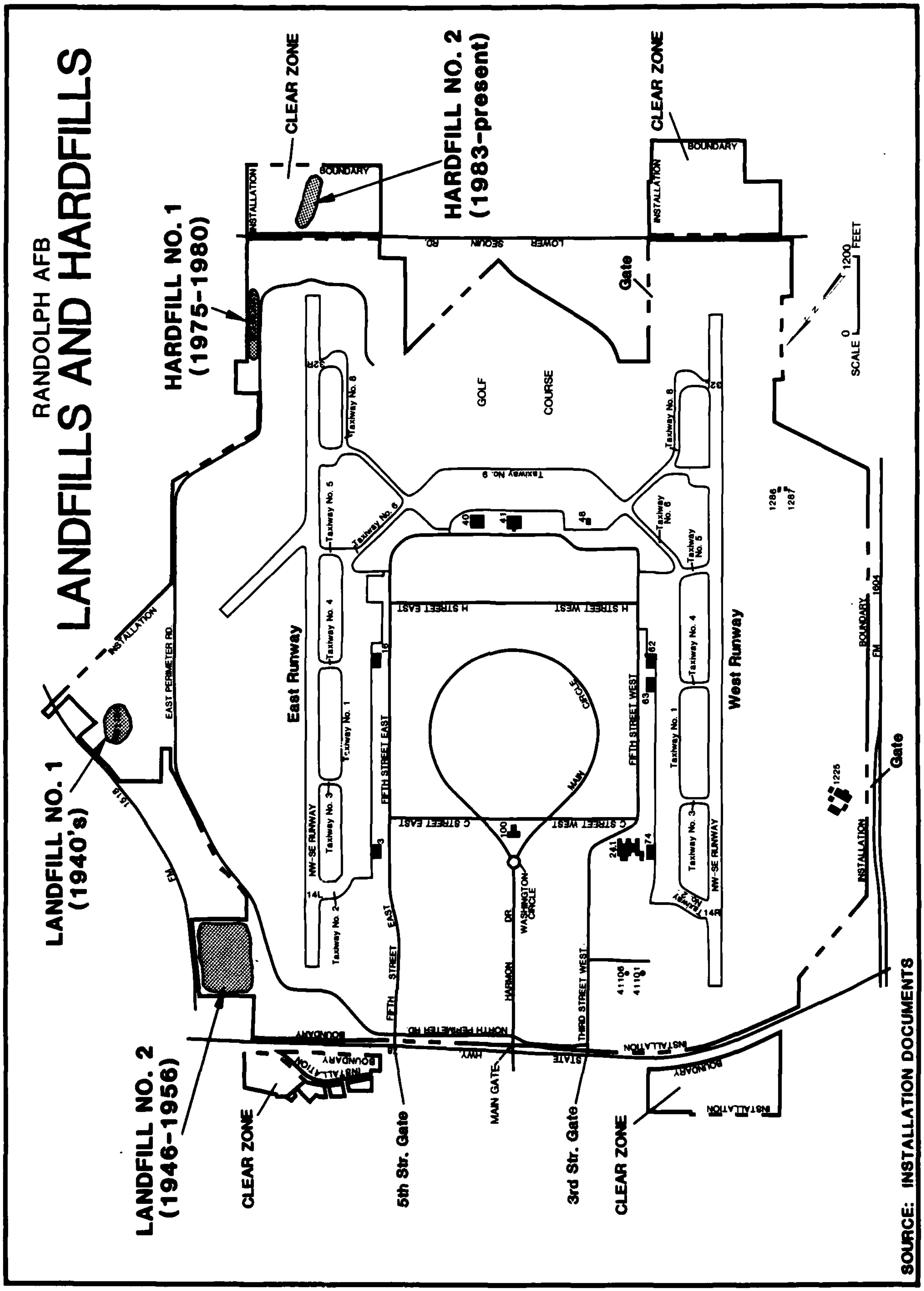
- Sanitary Sewerage System
- Oil-Water Separators
- Surface Drainage System

Landfills

In the early 1940's some landfill operations (Landfill No. 1) reportedly took place in the vicinity of and underneath the present Building 1160 at the east side of the base. The filling generally took place between the two existing major drainage channels in the area (Figure 4.5). This landfill received garbage, paper, wood, metal, brush, construction and demolition material. Shop wastes are suspected to have been taken to this site but the quantity is believed to be minimal. Wastes were buried in trenches about 15 feet deep. No burning reportedly took place at the landfill operation. There is no evidence of this landfill from either vegetation stress or differential ground settlement. Prior to and during the operation of Landfill No. 1, wastes were also taken to off-base disposal sites.

About 1946, waste disposal operations at Landfill No. 2 were started. Figure 4.5 shows the location of this landfill site at the northeastern corner of the base. Landfill No. 2 operated until approximately 1956. The area was filled using trenches about 8 to 12 feet deep. Wastes predominantly included garbage, paper, wood, metal, brush, and construction and demolotion debris. Shop wastes which were taken to the area included paint strippers, paints, thinners, transformer oil, and rags with fuel. It was indicated that during periodic base inspections, various miscellaneous wastes ended up being hauled to the landfill to clean up the shop areas. Burning took place at Landfill No. 2 on a regular basis.

An investigation by SARPMA in 1981 indicated from comparison of ground contours of the Landfill No. 2 area that it appeared probable that much of the site had been excavated as a borrow area after landfilling took place. It was suggested the buried wastes were either physically removed from the site or removed and reburied during the excavation. However, long-term employees at Randolph AFB could not substantiate any extensive excavation taking place at the Landfill No. 2 site. In addition, differential settlement in somewhat regular trench


RANDOLPH AFB
LANDFILLS AND HARDFILLS
LANDFILL NO. 1 (1940's)
LANDFILL NO. 2 (1946-1956)
HARDFILL NO. 1 (1975-1980)
HARDFILL NO. 2 (1983-present)
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
5th Str. Gate
MAIN GATE
3rd Str. Gate
Gate
Gate
East Runway
West Runway
GOLF COURSE
LOWER SEGUIN RD.
EAST PERIMETER RD.
NORTH PERIMETER RD.
FIFTH STREET EAST
FIFTH STREET WEST
THIRD STREET WEST
HARMON DR
MAIN CIRCLE
WASHINGTON CIRCLE
H STREET EAST
H STREET WEST
C STREET EAST
C STREET WEST
INSTALLATION BOUNDARY
NW-SE RUNWAY
Taxiway No. 9
SCALE 0 1200 FEET
SOURCE: INSTALLATION DOCUMENTS

patterns was observed at the site during this IRP study. Former base grounds personnel also confirmed the irregular terrain from experience in mowing and maintaining the site. Therefore, Landfill No. 2 is retained as a potential site for evaluation as part of the IRP.

Table 4.4 summarizes the landfill operations at the base and Appendix F presents some photographs.

From 1956 until 1973 wastes were disposed east of the base on property leased by the Air Force. From 1956 to 1957 the Air Force collected wastes and hauled them to this off-base disposal site, but in 1958 contract collection was initiated. After 1973 wastes were collected and disposed at various off-base sites by contractors. The off-base facilities continue to be used at the present time.

Hardfills

Construction and demolition material routinely was taken to the landfills which served to dispose of other base solid wastes. However, two areas received only hardfill materials (Table 4.4). Hardfill No. 1, near Eberle Park, was operated in the 1975-1980 period and received concrete, rock, soil and other demolition or construction debris. Hardfill No. 2 has been operating since 1983 near the southern end of the east runway. Wastes received include concrete, rocks, wood, brush and other construction/demolition debris. Both hardfill areas have been used to fill natural ravine areas up to about 10 feet deep.

Figure 4.5 shows these hardfill areas. From interviews and field observations it was determined that hazardous materials were not taken to these sites. Therefore, these sites are not considered to have potential for contamination or migration of hazardous materials.

Medical Sanitary Area

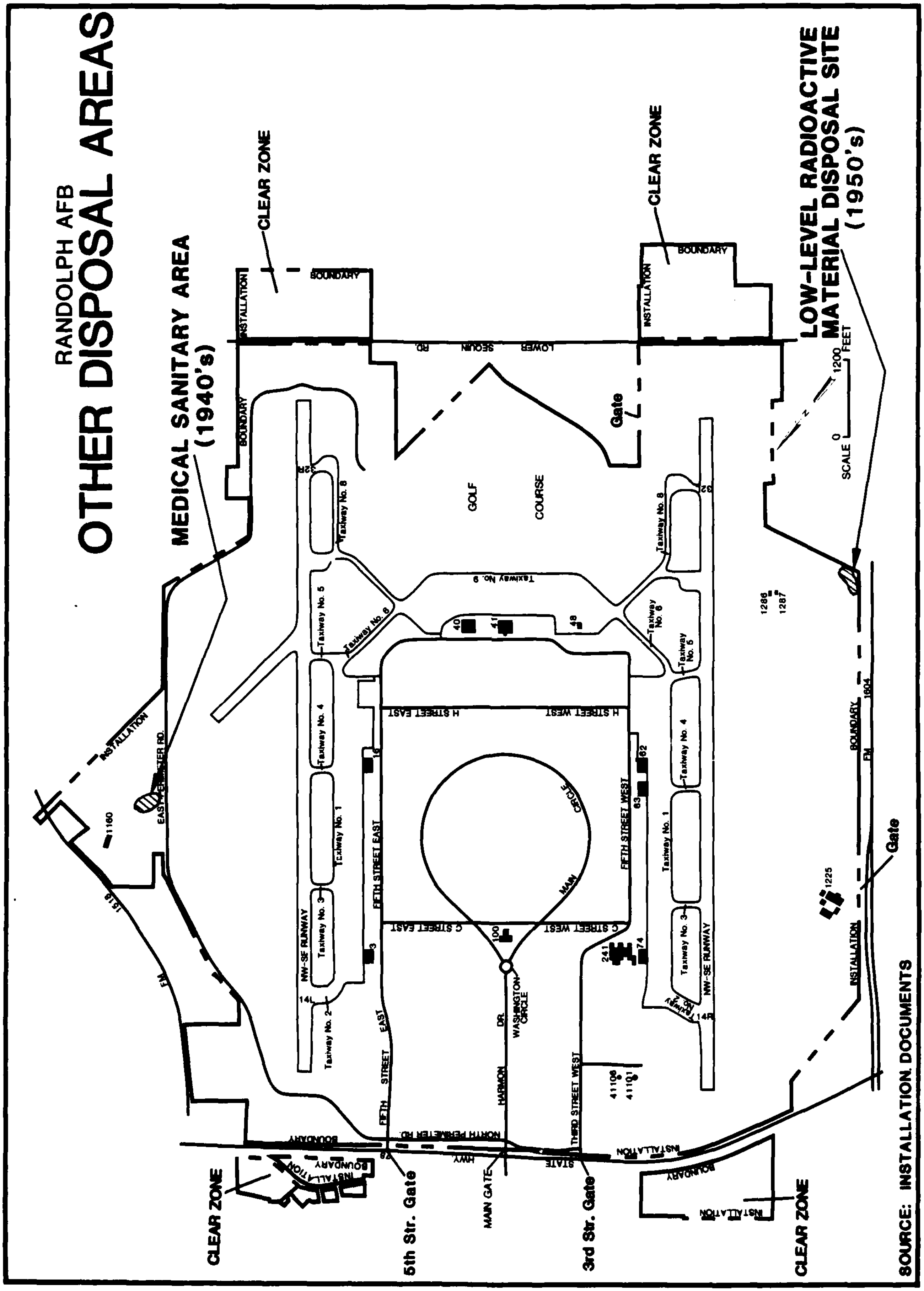
A disposal area suspected to have operated in the 1940's was noted in the previously mentioned 1981 SARPMA Study. This area was referred to as an "Aviation Medical Sanitary Area" and is shown in Figure 4.6. A comparison by SARPMA of 1946 and current topographic maps indicated the medical sanitary area may have been covered by several feet of soil through grading changes. Interviews with long-term employees did not confirm operation of this site as a disposal area. There is no record of materials disposed in the area.

TABLE 4.4
SUMMARY OF LANDFILLS, HARDFILLS AND BURIAL AREAS

Site	Period of Operation	Approximate Area (acres)	Type of Wastes	Method of Operation	Comments
Landfills					
No. 1	1940's	3	Garbage, refuse, construction/ demolition material, brush, and shop wastes (thinners, paints, strippers)	Trench fill; about 15 feet deep	Disposal of shop wastes is suspected and not confirmed. Site closed, covered and Building 1062 built on it.
No. 2	1946-1956	20	Garbage, refuse, brush, construction/demolition materials, and shop wastes (thinners, paints, strippers, transformer oil and rags with fuel)	Trench fill; from 8-12 feet deep	Site closed and covered; currently used for horse grazing area.
Hardfills					
No. 1	1975-1980	3	Construction/demolition debris, soil, rock and concrete	Ravine; about 10 feet deep	Site closed and covered.
No. 2	1983-present	2	Construction/demolition debris, concrete, brush, rock, wood	Ravine; about 10 feet deep	Currently being used.
Medical Sanitary Area	1940's	0.7	Suspected medical wastes - type unknown	Unknown - believed shallow depth	Site closed and covered. Disposal of any wastes in this area is only suspected.
Radioactive Material Burial Site	1950's	0.2	Radioactive medical wastes - low level	Unknown - believed contained in concrete vaults at shallow depth	Records of disposal in 1957-1958 only but possible other occasions in 1950's; surface level readings have not detected elevated levels of radioactivity.

Source: Interviews and installation documents.

FIGURE 4.6



RANDOLPH AFB
OTHER DISPOSAL AREAS
MEDICAL SANITARY AREA (1940's)
LOW-LEVEL RADIOACTIVE MATERIAL DISPOSAL SITE (1950's)
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
CLEAR ZONE
INSTALLATION BOUNDARY
LOWER SEGUIN RD.
GOLF COURSE
Gate
Gate
SCALE 0 1200 FEET
NW-SE RUNWAY
NW-SE RUNWAY
Taxiway No. 9
FIFTH STREET EAST
FIFTH STREET WEST
H STREET EAST
H STREET WEST
G STREET EAST
G STREET WEST
MAIN CIRCLE
WASHINGTON CIRCLE
HARMON DR.
THIRD STREET WEST
NORTH PERIMETER RD.
STATE HWY.
EAST PERIMETER RD.
FM 1518
FM 1604
MAIN GATE
5th Str. Gate
3rd Str. Gate
SOURCE: INSTALLATION DOCUMENTS

Low-Level Radioactive Material Disposal Site

Drawings of Randolph AFB note a low-level radioactive burial grounds in the southwestern corner of the installation (Figure 4.6). This area is posted with signs. Air Force data indicate that some medical waste materials containing radioactive substances were placed at this location in 1957-58. This was during the operation of the Aviation Medical Services. Records and discussions with employees could not establish whether this was a one-time-only burial of radioactive material. The records indicate the following quantities were buried in 1957-58:

Carbon 14 - 70.042 millicuries
Cerium 144 - 0.145 millicuries
Cesium 137 - 0.016 millicuries

Low-level radioactive wastes buried during this time period were typically contained in concrete. In the 1960's and early 1970's electron tubes containing low-level radioisotopes were also disposed of at this site.

Periodic monitoring surveys of the site have been undertaken by BES. The most recent one in January 1984 revealed no detectable readings at ground surface.

Sanitary Sewerage Systems

Until 1977 Randolph AFB treated all its wastewater at a plant located across the FM 1518 road from the riding stables (east of Building 1160). In 1977 the wastewater treatment plant was abandoned and all flows were directed to the off-base plant operated by the Cibilo Creek Municipal Authority (CCMA).

Both the abandoned Air Force treatment plant and the current CCMA plant have had periodic discharges of oils and other high organic waste loads indicating some shop wastes have been sent to the sanitary sewerage system. Discharge of industrial/shop wastes was much more prevalent in the 1950's and 1960's compared to the more recent years. In the late 1960's and early 1970's better controls were initiated to minimize the discharge of industrial wastes to the sewerage system.

Oil-Water Separators

There are eleven oil-water separators on base, eight of which are above ground. Table 4.5 lists the existing oil-water separators. Effluent from all the separators discharges into the sanitary sewer system except the one at the FPTA which discharges to an evaporation pond. As indicated in Figure 4.7, the oil-water separators are located in major activity areas around the base. All but one (No. 22) are above ground operations and barrels are placed below the separators to collect oil and sludges. The oil-water separators were installed in 1972 to 1973. Since 1978, SARPMA has maintained these units; previously this was the responsibility of civil engineering and maintenance. The waste oils collected by the separator are sold to off-base contractors by DPDO.

Several of the oil-water separators service paint stripping operations. The waste generated from these shops contained high concentrations of phenols (over 200 mg/l) which were not effectively removed by the separators. In 1977 a low phenolic stripper product replaced the old stripper. This action reduced the phenol load to the oil-water separators and subsequent hazard to the local sewage treatment system and Cibolo Creek.

Surface Drainage System

The surface drainage system consists of overland flow discharging to open drainage ditches and/or storm sewers (Figure 3.2). There are three main drainage areas: one on the west side which drains south to Woman Hollow Creek and to Cibolo Creek; one on the east side which drains southeast directly into golf course impoundments and then into Cibolo Creek; and one for high water flows draining the northeast side directly into Cibolo Creek. The oil-water separators drain into the sanitary, not the storm drainage system, and therefore industrial wastes infrequently enter the storm system. Minor fuel spills are periodically washed into the drainage system.

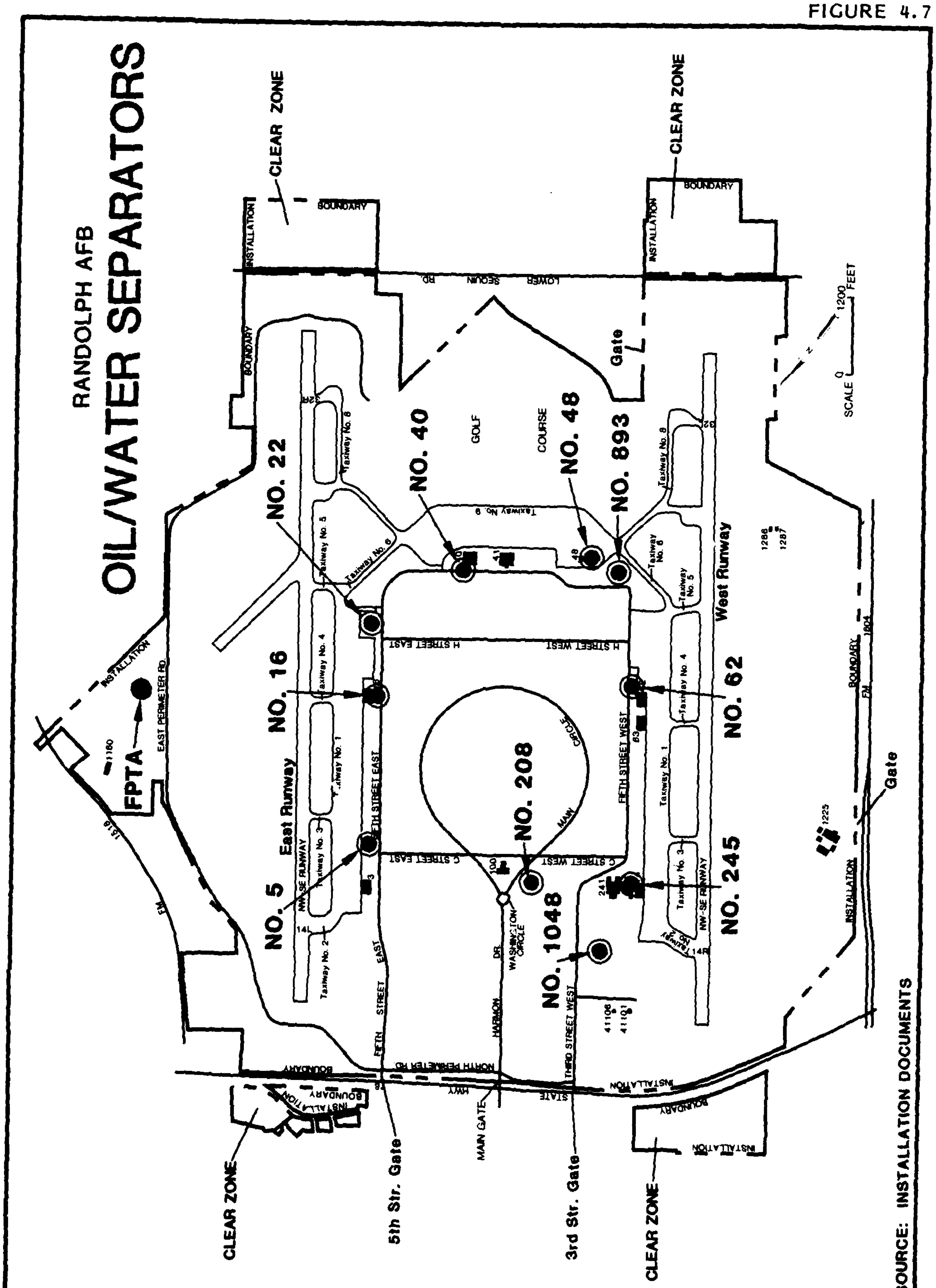
Considering the types and quantities of materials that have been discharged to the surface drainage system, the potential for contamination or migration is minor.

TABLE 4.5
OIL-WATER SEPARATORS

Separator No.[1]	Grade	Location and Contents[2]
5	Above	Oils, greases and soaps from area washracks
16	Above	Oils, greases and soaps from area washracks
40	Above	Washrack from Army Operations
48	Above	Oils, greases, solvents and residual stripper and paint chips
62	Above	Oils, greases and soaps from area washrack
245	Above	Oils, solvents, strippers and greases from Building 241 and 245 wastes
22	Below	Waste oils and fuels from area maintenance
893	Above	Clean-up waste oils, fluid, and soaps from auto hobby and wash area
1040	Above	Clean-up waste oils and fluids from area maintenance shops
208	Below	Waste oils and fuels from area maintenance
FPTA No. 2	Below	Jet fuel and residual fire extinguishing agents

(1) All oil-water separators discharge to the sanitary sewer system except the FPTA which discharges to an evaporation pond.
(2) See Figure 4.7 for location of these oil-water separators.

Source: Installation documents.



RANDOLPH AFB

OIL/WATER SEPARATORS

SOURCE: INSTALLATION DOCUMENTS

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

Review of past waste generation and management practices at Randolph AFB has resulted in identification of 17 sites and/or activities which were considered as areas of concern for potential contamination and migration of contaminants.

Sites Eliminated from Further Evaluation

The sites of initial concern were evaluated using the Flow Chart presented in Figure 1.2. Sites not considered to have a potential for contamination were deleted from further evaluation. The sites which have potential for contamination and migration of contaminants were evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.6 summarizes the results of the flow chart logic for each of the areas of initial concern.

Nine of the 17 sites assessed did not warrant further evaluation. The rationale for omitting these sites from HARM evaluation is discussed below.

Landfill No. 1 is an old site which is suspected to have received small quantities of shop wastes. Confirmation of the wastes disposed could not be verified from records or interviewees. There is no visual evidence of this disposal area or any indication of contamination. Based upon these factors, this site is not considered to represent a potential hazard to health, welfare or the environment.

The two hardfill areas have received concrete, rock, soil, and other demolition or construction debris. No reports were received of shop wastes going to these sites and visual observation indicates no potential contamination. Therefore these sites do not warrant further action.

Fire Protection Training Area No. 1 operated for a brief period in the 1940's. Waste petroleum products are suspected to have been burned at the FPTA No. 1 site. The site was extensively disturbed during the grading operations for the golf course construction. No visual evidence exists to locate this site. Based upon these factors, this site is not considered to be a potential source of contamination.

TABLE 4.6
SUMMARY OF FLOW CHART LOGIC FOR AREAS OF
INITIAL HEALTH, WELFARE AND ENVIRONMENTAL CONCERN
AT RANDOLPH AFB

Site	Potential Hazard to Health, Welfare or Environment	Need for Further IRP Evaluation/ Action	HARM Rating
Landfill No. 2	Yes	Yes	Yes
Fire Protection Training Area No. 2	Yes	Yes	Yes
Fire Protection Training Area No. 3	Yes	Yes	Yes
Low-Level Radioactive Material Disposal Site	Yes	Yes	Yes
POL Storage Tank Sludge Disposal Area	Yes	Yes	Yes
Tank T-16	Yes	Yes	Yes
FPTA No. 2 Fuel Tank	Yes	Yes	Yes
Seguin Auxiliary Airfield Fire Protection Training Area	Yes	Yes	Yes
Landfill No. 1	No	No	No
Fire Protection Training Area No. 1	No	No	No
Hardfill No. 1	No	No	No
Hardfill No. 2	No	No	No
Medical Sanitary Area	No	No	No
Sanitary Sewerage System	No	No	No
Surface Drainage System	No	No	No
Liquid Waste Storage Areas	No	No	No
Pesticide Handling	No	No	No

Source: Engineering-Science

The Medical Sanitary Area is a suspected disposal site from the 1940's. No record of the type of materials buried is available. Long-term employees could not verify the existence of this operation. Based upon these items, this site does not warrant further action.

The sanitary sewerage system has received hazardous materials from the shops in the past. Similarly, but to a much lesser degree, the surface drainage system has had shop wastes discharged to it. The wastewater has received treatment by the base or the local government prior to discharge to Cibilo Creek. An oil removal system was provided for several years on the storm drainage system discharge discharging to Cibilo Creek. Closed conduits have predominantly been used for both the sanitary and storm systems to transport wastes off-base and it is judged minimal potential contamination has resulted.

Some of the areas utilized for storing liquid wastes have been noted to have evidence of leaking containers to the ground or slab. Considering the small quanitities and the site characteristics, these are judged to result in minimal contamination.

Pesticides have been handled at three sites. No major spills have been reported and present operations do not suggest potential for environmental contamination.

Sites Evaluated Using HARM

The remaining eight sites identified in Table 4.6 were evaluated using the Hazard Assessment Rating Methodology. Some of the sites were combined for the rating due to their close proximity. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. Results of the HARM analysis for the sites are summarized in Table 4.7.

The procedures used in the HARM system are outlined in Appendix G and the specific rating forms for the eight sites at Randolph AFB are presented in Appendix H. The HARM system is designed to indicate the relative need for follow-on action.

TABLE 4.7
SUMMARY OF HARM SCORES FOR
POTENTIAL CONTAMINATION SITES
AT RANDOLPH AFB

Rank	Site	Receptor Subscore	Waste Charac-teristics Subscore	Pathways Subscore	Waste Management Factor	HARM Score
1	Landfill No. 2 and Fire Protection Training Area No. 3	64	80	50	1.0	65
2	Fire Protection Training Area No. 2 and FPTA Fuel Tank	59	80	50	1.0	63
3	POL Tank Sludge Disposal Area	72	64	35	1.0	57
4	Tank T-16	61	40	43	1.0	48
5	Sequin Fire Protection Training Area	47	48	43	1.0	46
6	Low-Level Radioactive Material Disposal Site	57	30	43	0.5	22

Source: Engineering-Science

SECTION 5
CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contamination migration from these sites. The conclusions given below are based on field inspections; review of records and files; review of the environmental setting; interviews with base personnel, past employees and local, state and federal government employees; and assessments using the HARM system. Table 5.1 contains a list of the potential contamination sources identified at Randolph AFB and a summary of the HARM scores for those sites.

LANDFILL NO. 2 AND FIRE PROTECTION TRAINING AREA NO. 3

Landfill No. 2 and FPTA No. 3 have sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 2 was the largest operating landfill on base. In addition to the normal base solid wastes it received paint strippers, paints, thinners and rags with fuels and other residuals. FPTA No. 3 operated for a short period on the Landfill No. 2 site. Waste materials including solvents, thinners, oils and contaminated fuels were burned. Water was not applied to the ground prior to burning and no facilities were constructed for collecting unburned residuals. The receptor and waste characteristic subscores primarily contributed to the HARM score of 65.

FIRE PROTECTION TRAINING AREA NO. 2 AND FPTA FUEL TANK

This FPTA operated in the eastern part of the base for a number of years has sufficient potential to create environmental contamination and follow-on investigation is warranted. Wastes burned at the site included oils, thinners, solvents and contaminated fuels. Some of the

TABLE 5.1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
RANDOLPH AFB

Rank	Site	Operation Period	HARM Score(1)
1	Landfill No. 2 and Fire Protection Training Area No. 3	1946-1956 1957-1958	65
2	Fire Protection Training Area No. 2 and FPTA Fuel Tank	Late 1940's - present	63
3	POL Tank Sludge Disposal Area	1951 - 1975	57
4	Tank T-16	1947-1983	48
5	Seguin Fire Protection Training Area	Late 1960's - early 1970's	46
6	Low-Level Radioactive Material Disposal Site	1950's	22

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual rating forms are in Appendix H.

Source: Engineering-Science

burning areas were prewetted with water but others were not. The burning areas were located in different portions of the site during the operating history. Thus, even though much of the top soil from the present site was reportedly removed during the 1984 reconstruction of the FPTA, further investigation of the area is desirable. The receptor and waste characteristic subscores primarily contributed to the HARM score of 63.

POL TANK SLUDGE DISPOSAL AREA

This disposal area for sludges resulting from POL tank cleaning has sufficient potential to create environmental contamination and follow-on investigation is warranted. Residuals from cleaning of the POL tanks at approximately 5-year intervals has been weathered on the ground in the 41101-41106 area since the 1950's. The receptor and waste characteristic subscores result in a total HARM score of 57.

TANK T-16

This 25,000 gallon tank (Facility No. 3072) located near Buildings 62 and 63 is concluded to have sufficient potential to create environmental contamination and follow-on investigation is warranted. The tank was a part of the aircraft fueling system until 1946. It is assumed the tank was then used to store oils and other liquid wastes prior to taking them to off-base disposal/processing sites. Recent testing of the tank for leaks has been inconclusive so the storage vessel is considered a suspected leaking tank for this analysis. The waste characteristic and pathways subscores contribute to a HARM value of 48.

SEGUIN FIRE PROTECTION TRAINING AREA

The Seguin FPTA is concluded to have minimal potential to create environmental contamination. Fire protection training activities at Seguin occurred for only a few years. Fuels were reportedly burned on the ground without prior application of water. The number of fires per year were low, resulting in a small waste quantity for burning at the site. Combustion of the small quantity of fuels will result in a small residual in the soil. The site is situated to minimize movement of soils or residuals. The receptor, waste characteristic and pathways subscores were all comparable for this site, resulting in a HARM total value of 46.

LOW-LEVEL RADIOACTIVE MATERIAL DISPOSAL SITE

The low-level radioactive material disposal site is concluded to have minimal potential to create environmental contamination. This site is suspected of receiving solid radioactive medical wastes primarily in the 1950's. Available records confirm burial of substances only in the 1957-1958 period. Low-level radioactive wastes buried in this time period were normally contained in concrete. The site received a total HARM score of 22 primarily due to the waste characteristics and pathways subscores.

OTHER

Several inactive water wells have been identified on base (Section 3). It is not known if these wells were properly abandoned (by grouting). Improperly abandoned wells may permit the migration of contamination from surface zones into the regional aquifer by way of deteriorated or corroded well casings.

SECTION 6
RECOMMENDATIONS

Six sites were identified at Randolph AFB as having the potential for environmental contamination. These sites have been evaluated and rated using the HARM system which assesses their relative potential for contamination and provides the basis for determining the need for additional Phase II IRP investigations. Four of the six sites have sufficient potential to create environmental contamination and warrant Phase II investigations. The remaining two sites have minimal potential to create environmental contamination. The sites evaluated have been reviewed concerning land use restrictions which may be applicable.

RECOMMENDED PHASE II MONITORING

The subsequent recommendations are made to further assess the potential for environmental contamination from the four waste disposal areas of concern at Randolph AFB. The recommended actions are sampling and monitoring programs to determine if contamination does exist at the site. If contamination is identified in this first-step investigation, the Phase II sampling program will need to be expanded to define the extent and type of contamination. The recommended monitoring program is summarized in Table 6.1 and discussed below for each site.

Landfill No. 2 and Fire Protection Training Area No. 3

It is recommended that five monitoring wells be installed at this combined landfill-FPTA site. One well should be located upgradient and the remaining four located along the landfill-installation boundary. Electromagnetic conductivity and magnetometer surveys are recommended to define the extent and characteristics of the disposal site and to aid in locating desirable sites for the monitoring wells. The parameters to be analyzed for the ground water samples (Table 6.2) are intended as a screening approach to determine potential contamination. More extensive

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT RANDOLPH AFB

Site (Rating Score)	Recommended Monitoring Program
Landfill No. 2 and Fire Protection Training Area No. 3 (65)	Conduct a geophysical survey using electromagnetic conductivity techniques to define the boundary of the filled area. Conduct a magnetometer survey of the site to identify any concentrated areas of buried metals such as drums. Based upon the data obtained in these physical site surveys, locate and install five monitoring wells. One well should be upgradient and the other four should be downgradient near the installation boundary which borders the site. It is anticipated the upper aquifer exists about 20 to 25 feet deep. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the aquifer. Allow the screen to extend above the water table to collect any floating materials. Sample and analyze the ground water for the parameters in Table 6.2.
Fire Protection Training Area No. 2 and FPTA Fuel Tank (63)	Conduct a geophysical survey of the existing burning area and the area north of the existing facilities to the installation boundary to outline subsurface conditions. Using the data from this survey, locate and install four monitoring wells (one upgradient and three downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated about 20 to 25 feet deep). Allow the screen to be above the top of the water table to obtain floating materials. Sample and analyze the ground water for the parameters in Table 6.2.

TABLE 6.1 (Continued)
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT RANDOLPH AFB

Site (Rating Score)	Recommended Monitoring Program
POL Tank Sludge Disposal Area (57)	Conduct a geophysical survey of the POL sludge disposal area to outline subsurface condition. Using the data from this survey, locate and install four monitoring wells (one upgradient and three downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated at about 20 to 25 feet deep). Sample and analyze the ground water for the parameters in Table 6.2.
Tank T-16 (48)	Install three monitoring wells (one upgradient and two downgradient) at the site. Construct the wells with Schedule 40 PVC and screen them 10 to 20 feet into the upper aquifer (estimated at about 20 to 25 feet deep). Sample and analyze the ground water for the parameters in Table 6.2.

Source: Engineering-Science

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS FOR PHASE II IRP AT RANDOLPH AFB

Landfill No. 2 and Fire Protection Training Area No. 3	POL Tank Sludge Disposal Area
pH	pH
Total Dissolved Solids	Oil and Grease
Oil and Grease	Total Organic Carbon
Total Organic Carbon	Total Organic Halogens
Total Organic Halogens	Lead
Phenols	
Lead	
PCB	

Fire Protection Training Area No. 2 and FPTA Fuel Tank	Tank T-16
pH	pH
Oil and Grease	Oil and Grease
Total Organic Carbon	Total Organic Carbon
Total Organic Halogens	Total Organic Halogens
Lead	Lead

Source: Engineering-Science

analyses may be necessary if positive results are obtained in the initial sampling.

Fire Protection Training Area No. 2 and FPTA Fuel Tank

For FPTA No. 2 four monitoring wells are recommended for installation (one upgradient and three downgradient). A geophysical survey of the site is recommended to determine subsurface conditions and to effectively locate the proposed monitoring wells. The parameters proposed to be analyzed for the ground water samples (Table 6.2) will serve as a screening to determine contamination at the site. More extensive tests may be required if positive results are obtained in the initial sampling.

POL Tank Sludge Disposal Area

Four monitoring wells (one upgradient and three downgradient) constructed into the upper aquifer are recommended for the POL sludge disposal area. A geophysical survey of the site is recommended to assess the subsurface conditions and to assist in strategically locating the monitoring wells. The parameters to be analyzed for the ground water samples (Table 6.2) will provide a screening to determine contamination at the site but more extensive tests may be required if positive results are obtained.

Tank T-16

Three monitoring wells (one upgradient and three downgradient) are recommended to be constructed in the upper aquifer at the Tank T-16 site. The parameters proposed for analysis of the ground water are listed in Table 6.2. More extensive tests may be needed if positive results are obtained in the initial sampling.

OTHER RECOMMENDATIONS

Inactive or abandoned wells located on base which have not been properly abandoned should be identified. The wells should be properly abandoned (by plugging or grouting) in accordance with Edwards Underground Water District regulations by a certified and experienced water well driller.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified sites to (1) provide continued protection of human health, welfare, and environment, (2) insure that migration of potential contaminants is not promoted through improper land uses, (3) facilitate compatible development of future USAF facilities and (4) allow identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each identified disposal site at Randolph AFB are presented in Table 6.3. A description of the land use restriction guidelines is included in Table 6.4. Land use restrictions at sites recommended for on-site monitoring should be re-evaluated upon completion of the Phase II program and appropriate changes made.

TABLE 6.3
RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS
RANDOLPH AFB

Site Name	Construction	Excavation	Wells	Agriculture	Silviculture	Water Infiltration	Recreation	Burning	Disposal Operations	Vehicular Traffic	Material Storage	Housing
Landfill No. 2 and Fire Protection Training Area No. 3	R	R	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Fire Protection Training Area No. 2 and FPTA Fuel Tank	NR	NR	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
POL Tank Sludge Disposal Area	NR	NR	R	NR	R	R	NR	R	R(2)	NR	NR(3)	R
Tank T-16	R	R	R	NR	R	R	NR	NR	R	NR(4)	NR(4)	R
Seguin Fire Protection Training Area	NR	NR	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Radioactive Material Burial Site	R	R	R	R	R	R	R	NR	R	R	R	R
Landfill No. 1	R	R	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Fire Protection Training Area No. 1	NR	NR	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Medical Sanitary Area	R	R	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Hardfill Nos. 1 and 2	NR	R	R	NR	NR	NR	NR	NR	NR	NR	NR	NR

(1) See Table 6.4 for description of guidelines.
Note the following symbols in this table:
R = Restrict the use of the site for this purpose.
NR = No restriction of the site for this purpose.
NA = Not applicable.
(2) Restrict for all wastes except for construction/demolition debris.
(3) No restriction on solid materials but liquids undesirable.
(4) If tank is designed for additional loads.
Source: Engineering-Science

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

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APPENDIX A

BIOGRAPHICAL DATA

ES ENGINEERING-SCIENCE

Biographical Data

ROBERT L. THOEM
Civil/Environmental Engineer

PII Redacted

[redacted]

Education

B.S. Civil Engineering, 1962, Iowa State University, Ames, IA
M.S. Sanitary Engineering, 1967, Rutgers University, New Brunswick, NJ

Professional Affiliations

Registered Professional Engineer in six states
American Academy of Environmental Engineering (Diplomate)
American Society of Civil Engineers (Fellow)
National Society of Professional Engineers (Member)
Water Pollution Control Federation (Member)

Honorary Affiliations

Who's Who in Engineering
Who's Who in the Midwest
USPHS Traineeship

Experience Record

1962-1965 U.S. Public Health Service, New York, NY. Staff Engineer, Construction Grants Section (1962-1964). Technical and administrative management of grants for municipal wastewater facilities.

Water Resources Section Chief (1964-1965). Supervised preparation of regional water supply and pollution control reports.

1966-1983 Stanley Consultants, Muscatine, IA and Atlanta, GA. Project Manager and Project Engineer (1966-1973). Responsible for managing studies and preparing reports for a variety of industrial and governmental environmental projects.

Environmental Engineering Department Head (1973-1976). Supervised staff involved in auditing environmental practices, conducting studies and preparing reports concerning water and wastewater systems, solid waste and resource recovery and water resources projects (industrial and governmental).

Resource Management Department Head (1976-1982). Responsible for multidiscipline staff engaged in planning and design of water and wastewater systems, solid waste and resource recovery, water resources, bridge, site development and recreational projects (industrial, domestic and foreign governments).

Associate Chief Environmental Engineer (1980-1983). Corporate-wide quality assurance responsibilities on environmental engineering planning projects.

Operations Group Head and Branch Office Manager (1982-1983). Directed multidiscipline staff responsible for planning and design of steam generation, utilities, bridge, water and wastewater systems, solid waste and resource recovery, water resources, site development and recreational projects (industrial, domestic and foreign governments). Administered branch office support activities.

Project Manager/Engineer for over 25 industrial projects, 25 city and county projects ranging in present study area population from 1,400 to 1,700,000, 10 regional (multi-county) planning or operating agency projects, five state agency projects, 10 projects for federal agencies, and several projects for Middle East governments.

1983-Date Engineering-Science. Senior Project Manager. Responsible for managing a variety of environmental projects. Conducted hazardous waste investigations at seven U.S. Air Force installations to identify the potential migration of contaminants resulting from past disposal practices under the Phase I Installation Restoration Program. Evaluated solid waste collection, disposal and potential for resource recovery at a U. S. Army post.

Publications and Presentations

Thirteen presentations and/or papers in technical publications dealing with solid waste, sludge, water, wastewater and project cost evaluations.

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted

[redacted]

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46) (Virginia No. 241)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government facilities. General experience included planning and management of several ground-water monitoring programs, John R. Absalon (Continued)

development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date — Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and otherindustrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

Eleven presentations and/or papers in technical publications or conferences dealing with geology, ground water, and waste disposal/-ground water interaction.

Biographical Data

JAMES R. BUTNER

Environmental Scientist

PII Redacted

[redacted]

Education

B.S. Tulane University, Biological Sciences, 1976
M.S. University of Florida, Environmental Engineering Sciences, 1983

Professional Affiliations

Water Pollution Control Federation
Society of Wetlands Scientists

Experience Record

1977-1979 Horticulturalist in the Horticultural industry in Gainesville, Florida. Primary areas of experience were in botany, evaluation of the uses of native plant species, and business management.

1979-1981 Center for Wetlands, University of Florida. His involvement focused on evaluating the public health aspects of wastewater recycling through wetlands, the subject of his Master's thesis. Mr. Butner's other activities included modeling the survivorship of pathogens in surface and ground waters, vegetation analysis, and application of computer statistical software (SAS) to large data sets generated from revegetation studies of phosphate mined lands in central Florida. Mr. Butner's coursework included graduate level courses in Environmental Chemistry, Nutrients and Eutrophication, Water Resources Planning, Fortran Programming, Toxicology, Ecological Modeling and Statistics.

1982-1984 Claude Terry & Associates, Inc. (CTA). As an Environmental Scientist, his primary responsibilities were involved the collection, review and analysis of technical data and institutional issues associated with effluent discharge into wetlands. These duties were in conjunction with the production of a generic eight-state Environmental Impact Statement for Region IV EPA entitled "Freshwater Wetlands for Wastewater

Management". Other projects have involved conducting environmental inventories and recommending mitigation to preserve and protect natural resources for other EIS work. He was involved in the design of various sampling programs, the collection, analysis, and interpretation of chlorophyll and periphyton data as part of the Georgia Statewide Nonpoint Source Study, and training laboratory personnel in wet chemistry techniques.

1984-Present Engineering-Science, Inc. Environmental Scientist responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Involved in the development of environmental studies, inventories, and evaluations for municipal, industrial, and Federal government projects.

Publications

Coauthor of the publication (1983), "Survival of Virus and Enteric Bacteria in Groundwater", Journal of Groundwater.

Paper entitled, "Freshwater Wetlands for Wastewater Management: An integrated framework for decision-making and wetlands protection", presented at the 1984 Research Triangle Conference on Environmental Technology, Raleigh, N.C., March 1984.

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

TABLE B.1
LIST OF INTERVIEWEES

	Most Recent Position	Years of Service
1.	NCOIC Non Destructive Inspections	4
2.	Supervisor Corrosion Control	8
3.	NCOIC PMEL	2
4.	PMEL Civilian Employee	7
5.	Supervisor Battery Shop	14
6.	Supervisor Metal Cleaning	14
7.	Supervisor Welding	16
8.	Supervisor Machine Shop	10
9.	NCOIC Machine Shop	2
10.	Accessory Repair Technician	15
11.	Engine Test Cell Technician	22
12.	NCOIC AGE	1
13.	Civilian AGE employee	19
14.	Civilian AGE employee	23
15.	Supervisor Pneudraulics	19
16.	Supervisor Aircraft Branch	24
17.	Supervisor Fuel Systems Repair	15
18.	Supervisor TA Fabrication	25
19.	Supervisor Plumbing	10
20.	Supervisor Fuels	15
21.	Protective Coating Civilian Employee	22
22.	Supervisor Power Production	8
23.	Supervisor Photo Lab	4

TABLE B.1 (Continued)
LIST OF INTERVIEWEES

	Most Recent Position	Years of Service
24.	Supervisor Visual Aids	15
25.	NCOIC Radar Maintenance	2
26.	NCOIC Weather Maintenance	1
27.	NCOIC NAVAIDS Maintenance	1
28.	NCOIC Radio Maintenance	3
29.	Former NCOIC Washracks	5
30.	39th Sq. Washracks (No. 16) NCOIC	3
31.	37th Sq. Washracks (No. 75) NCOIC	3
32.	Supervisor Printing Shop	4
33.	Director Arts/Crafts and Auto/Hobby	17
34.	Supervisor Battery Shop	19
35.	Foreman Refueling Maintenance	3
36.	Civilian Fire Truck Maintenance	17
37.	Clinic Technician	3
38.	Tractor Operator Foreman, SARPMA	30
39.	Foreman, Entomology	24
40.	Gardener, Pavement & Grounds	35
41.	Chief, Production Control, Civil Engineering	33
42.	Work Control Supervisor, Civil Engineering	34
43.	Golf Course Supervisor	22
44.	Material Sorter & Classifier, Salvage	11
45.	Truck Driver & Heavy Equip. Operator, Salvage	33
46.	Deputy Fire Chief	5

TABLE B.1 (Continued)
LIST OF INTERVIEWEES

	Most Recent Position	Years of Service
47.	Assistant Fire Chief, Fire Training	20
48.	Chief Construction Inspector	17
49.	Environmental Planner, Civil Engineering	4
50.	Recreation Aide	6
51.	Bioenvironmental Engineer	1
52.	Water Plant Supervisor	4
53.	Water Plant Operator	26
54.	Quality Assurance Evaluator	30
55.	Assistant Fire Chief (Retired)	33
56.	Assistant Fire Chief	20
57.	Environmental Engineer, ATC	13
58.	Chief, Civil Branch, ATC	23
59.	Foreman, A/C - Refrigeration, Civil Engineering	35
60.	NCOIC, POL Quality Control and Inspection	5
61.	Manager, BX Service Station	6
62.	Assistant Fire Chief (Retired)	32
63.	Water & Wastewater System Supervisor (Retired)	43
64.	Truck Driver	1
65.	Radiation Protection Officer, Brooks AFB	15

TABLE B.2
OUTSIDE AGENCY CONTACTS

Richard D. Reeves, Hydrologist
Robert W. Maclay, Hydrologist
Paul M. Buszka, Hydrologist
U.S. Geological Survey - Water Resources Division
North Plaza Suite 234
435 Isom Road
San Antonio, Texas 78213
512/344-9731

Robert W. Bader, Geologist
Edwards Underground Water District
1615 N. St. Mary's Street
San Antonio, Texas 78212
512/222-2204

Donald D. Higgins, Engineering Assistant
Texas Department of Health - Solid Waste Management Program
212 Stumberg Street
San Antonio, Texas 78204
512/225-4343

Henry Karnei, Jr., Field Representative
Texas Department of Water Resources - Water Quality Division
321 Center Street
San Antonio, Texas 78222
512/226-3297

H. Harold Bryant, District Conservationist
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APPENDIX C

TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C

TENNANT ORGANIZATIONS AND MISSIONS

Following is a listing of the tenant organizations at Randolph AFB along with the mission for major units.

Air Force Manpower and Personnel Center

The Center executes personnel plans and programs and supervises procedures applicable to worldwide management and administration of Air Force military personnel.

Air Force Occupational Measurement Center

The Center provides test development in support for the WAPS program and USAF Occupation Survey Program.

Air Training Command, Headquarters

The ATC Headquarters is responsible for military technical flying and professional training and education.

Ft. Sam Houston Flight Detachment

This tenant provides Army Aviation support to Headquarters Fifth U.S. Army, Readiness Region VII, Health Services Command and Southwestern Regional Recruitment Command, and other aviation support as directed.

San Antonio Real Property Maintenance Agency (SARPMA)

SARPMA provides professional support to Randolph AFB primarily in civil engineering areas.

1400th Military Airlift Squadron, Detachment 2

The 1400th Squadron performs Air Force directed support aircraft during peacetime, contingencies, and wartime. These missions include priority movement of personnel and cargo with time, place, or mission sensitive requirements. Also provided is 24 hour alert aircraft and crews for HQ MAC/DOOF directed missions in support of Brook Army Medical Center (burn center) and Wilford Hall Medical Center, Lackland AFB.

Air Force Instrument Flight Center

This tenant is responsible for the development, review and update of instrument flight procedures, manuals, training programs and publications.

Other Randolph Tenant Organizations

Air Force Audit Agency
Air Force Central Labor Law Office
Air Force Commissary Service, Detachment 5
Air Force Management Engineering Agency
Air Force Manpower and Personnel Management Team
Air Force Office of Civilian Personnel Operations
Air Force Office of Special Investigations, Detachment 1040
Air Force Recruiting Service, Headquarters
Air Force Trial Judiciary Third Circuit
Air Force Trail Judiciary Area Defense Counsel
Defense Investigative Service. OL-R
Joint Personal Property Shipping Office
Red Cross
San Antonio Contracting Center, Detachment 4
United States Postal Service
24th Weather Squadron, Detachment 1
405th Field Training Detachment
2015th Communications Squadron
3302nd Computer Service Squadron
3305th School Squadron
3314th Management Engineering Squadron, Detachment 14
Lear Seigler, Inc.

APPENDIX D

SUPPLEMENTAL BASE FINDINGS INFORMATION

TABLE D.1
PESTICIDES CURRENTLY STORED/USED
AT RANDOLPH AFB

Insecticides	Rodenticide	Herbicides
Dursban	Diphacinone	Hyvar X
Dursban 2E	Rodenticide	Formula 40
Sevin Dust	Warfarin	Messomate
Diazinon	Gofer Bait	Primatol
Killer Bait	Rat Sorb	Roundup
Bactur-W		Gro Tard
Chlordane		Eplam 5
Phostoxin		Turf Tonic
Amdro		2, 4-D
Malathion		
Baygon		
Wasp Freeze		
Lead Arsenate	**Other Pesticides**	
Insect Repellant	Avitrol	
Larva Luv	Roost No More	Precore
	Skunk Sorb	Hav-a-Hart
	Fore	DDVP
	Kromad	Zolon
	Micro Gen.	Fumasol
	Zinc Sulfate	Kilthane
	Baytex	Power Kill
	Prescription Treat	Cythion
	Pyrethrum Oil	Phenotrin A
	Ficam W.	
	Terrochloro	

TABLE D.2

TEXAS SURFACE WATER QUALITY STANDARDS

FRESH AND TIDAL WATERS

GUADALUPE RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA					COLIFORM	
SEGMENT												
NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/ (100 ml)—log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
1801	Guadalupe River Tidal—Guadalupe Bay to Guadalupe-Blanco River Authority salt water barrier	X	X	X					5.0	6.5–9.0	200	95
1802	Guadalupe River—Guadalupe River Authority salt water barrier to San Antonio River confluence	X	X	X	X	100	80	500	5.0	6.5–9.0	200	90
1803	Guadalupe River—San Antonio River confluence to San Marcos River confluence	X	X	X	X	100	50	400	5.0	6.5–9.0	200	93
1804	Guadalupe River—San Marcos River confluence to Comal River confluence	X	X	X	X	80	50	400	5.0	6.5–9.0	200	90
1812*	Guadalupe River—Comal River confluence to Canyon Dam	X	X	X	X	40	40	400	6.0	6.5–9.0	200	90
1805	Canyon Lake	X	X	X	X	40	40	400	5.0	6.5–9.0	200	90
1806	Guadalupe River—Canyon Lake headwater to headwater of river	X	X	X	X	40	40	400	5.0	6.5–9.0	200	90
1807	Coleto Creek—Guadalupe River confluence to headwaters	X	X	X	X	250	100	500	5.0	6.5–9.0	200	93

*"This segment has been established in its geographical extent as that portion of the stream which is capable of recharging the Edwards Aquifer, and the Water Quality Standards for it have as a principal purpose the protection of the quality of the water infiltrating into, and therefore recharging, the aquifer."

Source: Texas Surface Water Quality Standards, 1984. Texas Administrative Code Section 333.21.

Printed 3/84

TABLE D.2 (Cont.)

TEXAS SURFACE WATER QUALITY STANDARDS

FRESH AND TIDAL WATERS

GUADALUPE RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA						
SEGMENT											COLIFORM	
NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/ (100 ml)— log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
1808	San Marcos River—Guadalupe River confluence to headwater	X	X	X	X	60	50	400	5.0	6.5–9.0	200	90
1809	Blanco River—San Marcos River confluence to Limekiln Road Ford west of Kyle	X	X	X	X	40	50	400	5.0	6.5–9.0	200	92
1813*	Blanco River—Limekiln Road Ford west of Kyle to headwaters	X	X	X	X	25	30	400	5.0	6.5–9.0	200	92
1810	Plum Creek—San Marcos River confluence to headwater		X	X		350	150	1,120	5.0	6.5–9.0	2,000	90
1811	Comal River—Guadalupe River confluence to headwater	X	X	X	X	25	30	400	5.0	6.5–9.0	200	90

*"This segment has been established in its geographical extent as that portion of the stream which is capable of recharging the Edwards Aquifer, and the Water Quality Standards for it have as a principal purpose the protection of the quality of the water infiltrating into, and therefore recharging, the aquifer."

Source: Texas Surface Water Quality Standards, 1984. Texas Administrative Code Section 333.21.

TABLE D. 2 (Cont.)

TEXAS SURFACE WATER QUALITY STANDARDS

FRESH AND TIDAL WATERS

SAN ANTONIO RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA						
SEGMENT											COLIFORM	
NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/ (100 ml)— log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
1901	San Antonio River—Guadalupe River confluence to headwater	*	X	X	X	200	150	700	5.0	6.5–9.0	2,000	90
1902	Cibolo Creek—San Antonio River confluence to MoPac R. R. Bridge West of Bracken		X	X	X	200	300	900	5.0	6.5–9.0	2,000	90
1908**	Cibolo Creek—MoPac R. R. Bridge West of Bracken to headwaters	X	X	X	X	40	75	400	5.0	6.5–9.0	200	90
1903	Medina River—San Antonio River confluence to USGS-TDWR Station 08180500	X	X	X	X	120	120	700	5.0	6.5–9.0	200	90
1909**	Medina River—USGS-TDWR Station 08180500 to Medina Lake Dam	X	X	X	X	50	75	400	5.0	6.5–9.0	200	90
1904	Medina Lake	X	X	X	X	50	75	400	5.0	6.5–9.0	200	88
1905	Medina River—Medina Lake headwater to Medina River headwater	X	X	X	X	40	100	400	5.0	6.5–9.0	200	88
1906	Leon Creek—Medina River confluence to SH 16 northwest of Leon Valley	X	X	X	X	120	120	700	5.0	6.5–9.0	200	95

*Not presently suitable, however, upon completion of proposed facilities, the quality will be improved.

**"This segment has been established in its geographical extent as that portion of the stream which is capable of recharging the Edwards Aquifer, and the Water Quality Standards for it have as a principal purpose the protection of the quality of the water infiltrating into, and therefore recharging, the aquifer."

Source: Texas Surface Water Quality Standards, 1984. Texas Administrative Code Section 333.21.

TABLE D. 2 (Cont.)

TEXAS SURFACE WATER QUALITY STANDARDS

FRESH AND TIDAL WATERS

SAN ANTONIO RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA					COLIFORM	
SEGMENT NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/ (100 ml)— log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
1907*	Leon Creek—SH 16 northwest of Leon Valley to headwaters	X	X	X	X	40	75	400	5.0	6.5–9.0	200	95
1910	Salado Creek—San Antonio River confluence to headwaters		X	X	X	50	200	550	5.0	6.5–9.0	2,000	90

*"This segment has been established in its geographical extent as that portion of the stream which is capable of recharging the Edwards Aquifer, and the Water Quality Standards for it have as a principal purpose the protection of the quality of the water infiltrating into, and therefore recharging, the aquifer."

Source: Texas Surface Water Quality Standards, 1984. Texas Administrative Code Section 333.21.

Printed 3/84

APPENDIX E

MASTER LIST OF SHOPS

APPENDIX E
MASTER LIST - INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
12TH FLIGHT TRAINING WING				
12th Field Maintenance Squadron				
Non-Destructive Inspection	80	Yes	Yes	Sanitary Sewer, DPDO
Corrosion Control	H-48 230	Yes	Yes	Sanitary Sewer, DPDO, Landfill
Battery Shop	241	Yes	Yes	DPDO, Sanitary Sewer
Structural Repair	241	Yes	No	Consumed in Process
Sheet Metal Shop	241	Yes	No	Consumed in Process
Fiberglass Shop	241	Yes	No	Consumed in Process
Machine Shop	241	Yes	Yes	Consumed in Process, DPDO
Metal Processing	241	Yes	No	Consumed in Process
Metal Cleaning	241	Yes	Yes	DPDO, Sanitary Sewer
Accessory Repair	H-76	Yes	Yes	DPDO
Engine Test Cell	85	Yes	Yes	DPDO
AGE	H-16	Yes	Yes	DPDO and FPTA
Electrical Repair	241	Yes	Yes	DPDO
Environmental Systems	241	Yes	Yes	DPDO
Wheel and Tire Shop	241	Yes	Yes	DPDO
Pneudraulics Shop	241	Yes	Yes	DPDO
Fuel System Repair	H-44	Yes	Yes	DPDO, Oil/Water Separator
PMEL	H-63	Yes	Yes	Landfill, DPDO
Avionics	H-63	Yes	No	Consumed in Process

APPENDIX E (Continued)
MASTER LIST - INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
12th Field Maintenance Squadron (Continued)				
Avionics Branch	H-63 748	No	No	-
Egress Shop	H-5	No	No	-
12th Training Fabrication Division				
T/A Woodworking	H-74	Yes	No	Consumed in Process
T/A Welding	H-74	Yes	No	Consumed in Process
T/A Paint	H-74	Yes	Yes	FDTA, DPDO
T/A Electrical	H-74	Yes	No	Consumed in Process
12th Transportation Division				
Vehicle Maintenance	1048	Yes	Yes	DPDO, FPTA
Battery Shop	1048	Yes	Yes	DPDO, Sanitary Sewer
Machine Welding	208	Yes	No	Consumed in Process
Paint and Body Shop	208	Yes	Yes	DPDO
Minor Maintenance	208	Yes	Yes	DPDO
Refueling Maintenance	22	Yes	Yes	DPDO, Sanitary Sewer
Fire Truck Maintenance	700	Yes	Yes	DPDO
Preservation Packing	H-73	No	No	-

APPENDIX E (Continued)
MASTER LIST - INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
12th Supply Squadron				
Bulk Storage	1042	Yes	Yes	DPDO
Pick-up and Delivery	H-72	Yes	No	Consumed in Process
West Issue	1047	Yes	No	Consumed in Process
Quality Control Lab	226	Yes	No	Consumed in Process
Fuels Maintenance	224	Yes	No	Consumed in Process
Fuels Distribution	S-21	Yes	No	Consumed in Process
Fuels Control Center	S-21	Yes	No	Consumed in Process
Preventative Maintenance	241	Yes	No	Consumed in Process
Liquid Fuel-Oxygen	1011	Yes	No	Consumed in Process
Helmet Fitting	H-12	Yes	No	Consumed in Process
USAF Clinic				
Dental Laboratory	902	Yes	Yes	DPDO, Sanitary Sewer
Dental X-ray	902	Yes	Yes	DPDO, Sanitary Sewer
Biomedical Maintenance	684	No	No	Sanitary Sewer
Medical X-ray	675	Yes	Yes	Sanitary Sewer
Medical Laboratory	675	No	No	Sanitary Sewer and Autoclave

APPENDIX E (Continued)
MASTER LIST - INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
12th Air Base Group				
Ceramic Hobby Shop	895	Yes	No	Consumed in Process
Base Reproduction	220	Yes	Yes	Sanitary Sewer, DPDO
Woodworking Hobby Shop	895	Yes	No	Consumed in Process
Photo Hobby Shop	895	Yes	Yes	DPDO, Sanitary Sewer
Auto Hobby Shop	897	Yes	Yes	DPDO, Sanitary Sewer
Security	235	No	No	-
Small Arms	H-74	Yes	No	Consumed in Process, DPDO, Re-use
Fire Department	700	Yes	No	Consumed in Process, Sanitary Sewer
12th Organization Maintenance Squadron				
Aircraft Washrack	H-16, H-6, H-75	Yes	Yes	Oil/Water Separator, Sanitary Sewer
T-37 Maintenance	H-75	Yes	No	Consumed in Process
T-38 Maintenance	H-6	Yes	No	Consumed in Process
T-39 Maintenance	H-16	Yes	No	Consumed in Process

APPENDIX E (Continued)
MASTER LIST - INDUSTRIAL SHOPS

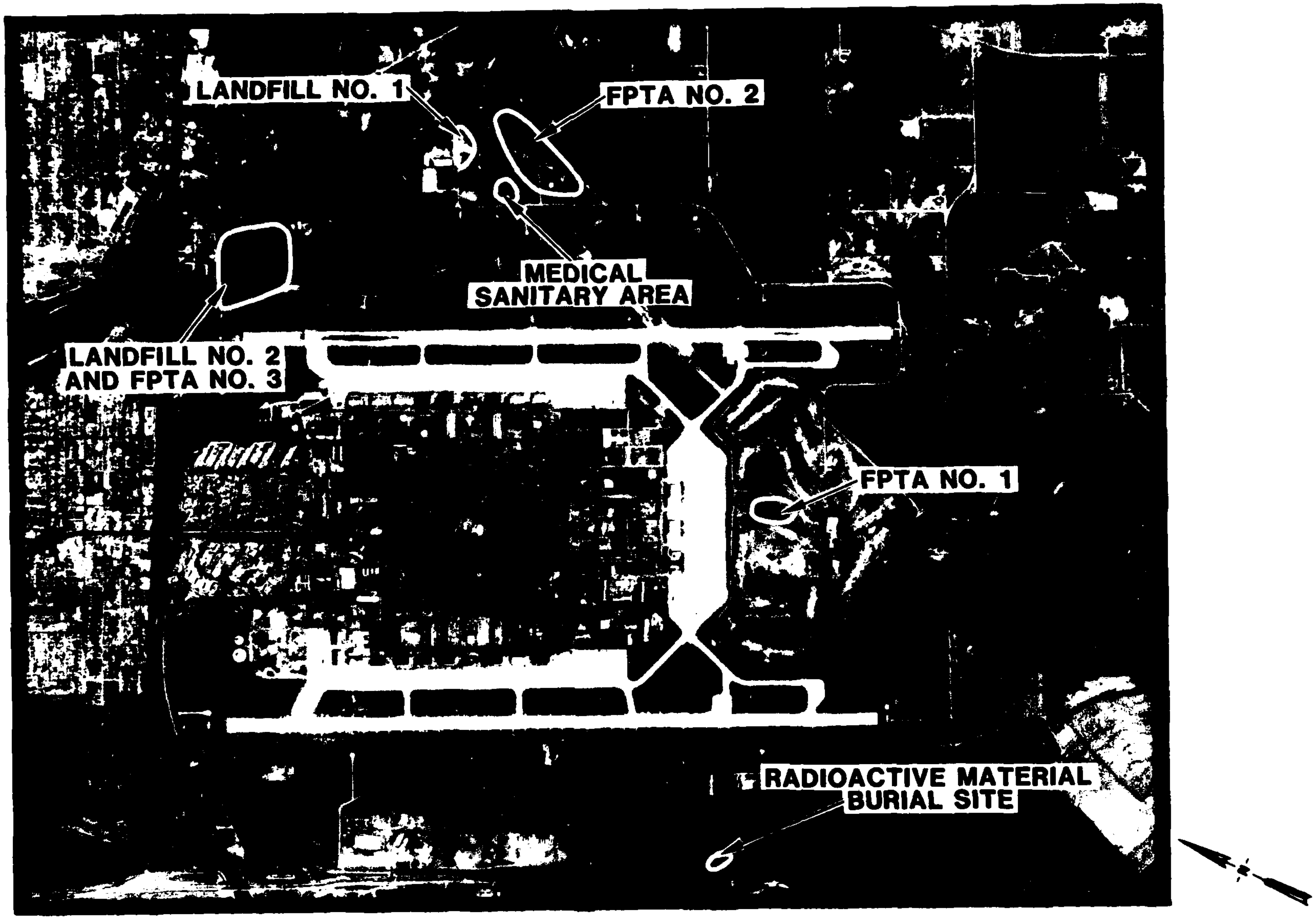
Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
12th Audio Visual Services				
Photo Laboratory	156	Yes	Yes	DPDO, Sanitary Sewer
Visual Aids	H-6	Yes	Yes	Sanitary Sewer, Landfill
2015th Communication Squadron				
NAVAIDS Maintenance	740	Yes	Yes	Landfill
Radar Communication and Radio Maintenance	2015	Yes	Yes	Landfill
TENANT ORGANIZATIONS				
SARPMA - Civil Engineering				
Entomology	1050	Yes	Yes	Reused in Mix Water/Storm Sewer or to Ground
Pavement and Grounds	1051	Yes	No	Consumed in Process
Heavy Equipment	1051	No	No	-
Airfield Cleaning	-	No	No	-
Structural Repair	H-62	Yes	No	Consumed in Process
Carpenter Shop	H-62	Yes	No	Consumed in Process
Masonry	-	No	No	-
Locksmith	-	Yes	No	Consumed in Process

APPENDIX E (Continued)
MASTER LIST - INDUSTRIAL SHOPS

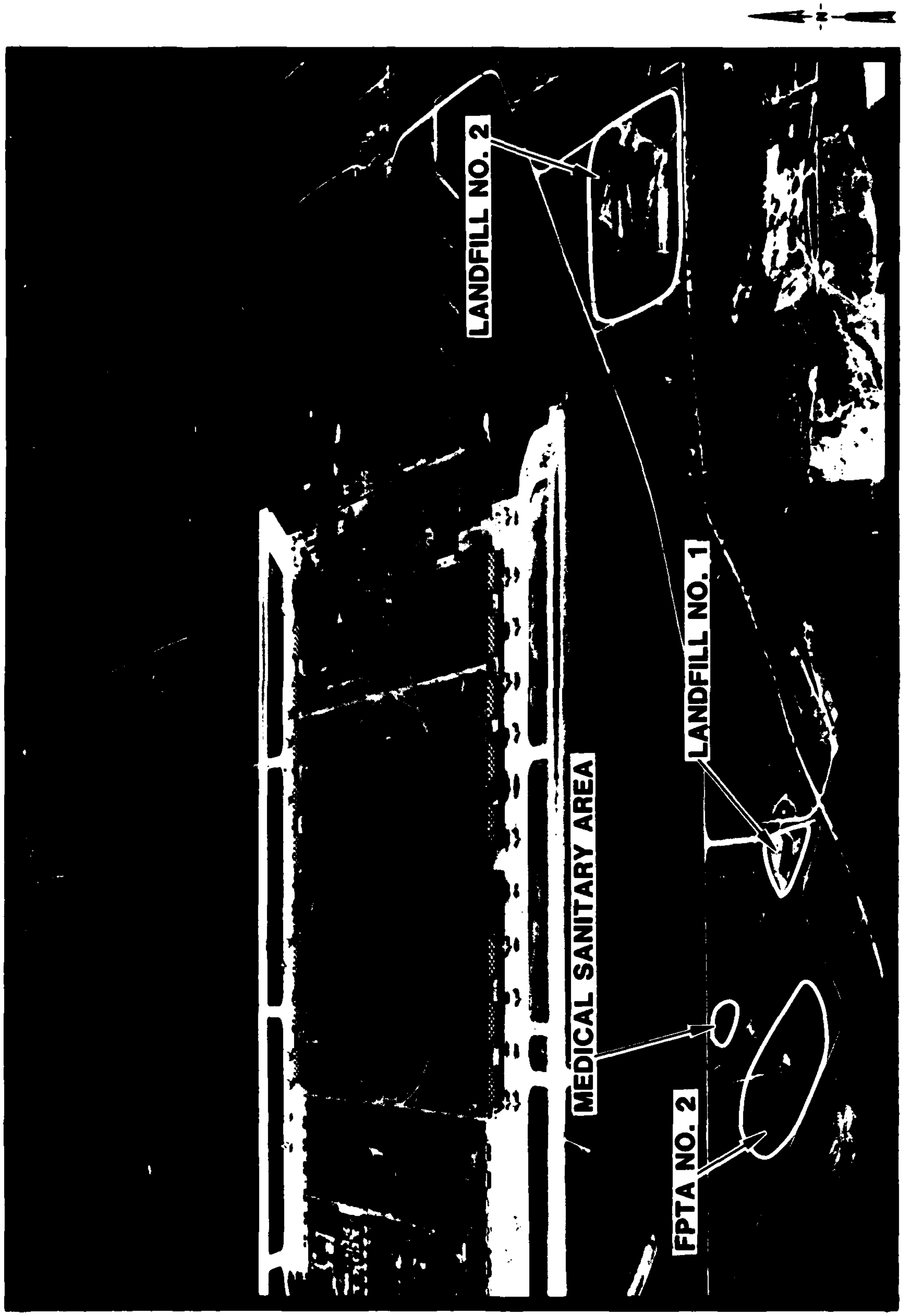
Name	Present Location (Bldg. No.)	Handles Hazardous Material	Generates Hazardous Wastes	Typical TSD Methods
SARPMA - Civil Engineering (Continued)				
Water Treatment Plant	-	Yes	No	Consumed in Process
Golf Course Maintenance	1350	Yes	No	Consumed in Process
Plumbing	H-62	Yes	No	Consumed in Process
Liquid Fuels	H-62	Yes	Yes	DPDO
Heating Maintenance	H-62	Yes	No	Consumed in Process
Boiler Plant Operations	-	No	No	-
Air Condition Mechanics	H-62	Yes	No	Consumed in Process
Electric Interior	H-62	Yes	No	Consumed in Process
Electric Exterior	H-62	Yes	Yes	DPDO
Power Production	1285	Yes	Yes	DPDO, Sanitary Sewer
Protective Coating	H-62	Yes	Yes	DPDO, Landfill
Welding	H-62	Yes	No	Consumed in Process
Metal Working	H-62	Yes	No	Consumed in Process
Kitchen Equipment Repair	H-62	Yes	No	Consumed in process
Energy Monitoring Control	H-62	No	No	-
Lear Siegler, Inc.				
Aircraft Stripping and Painting Operations	H-41,42, 47	Yes	Yes	DPPO, Sanitary Sewer

APPENDIX F

PHOTOGRAPHS

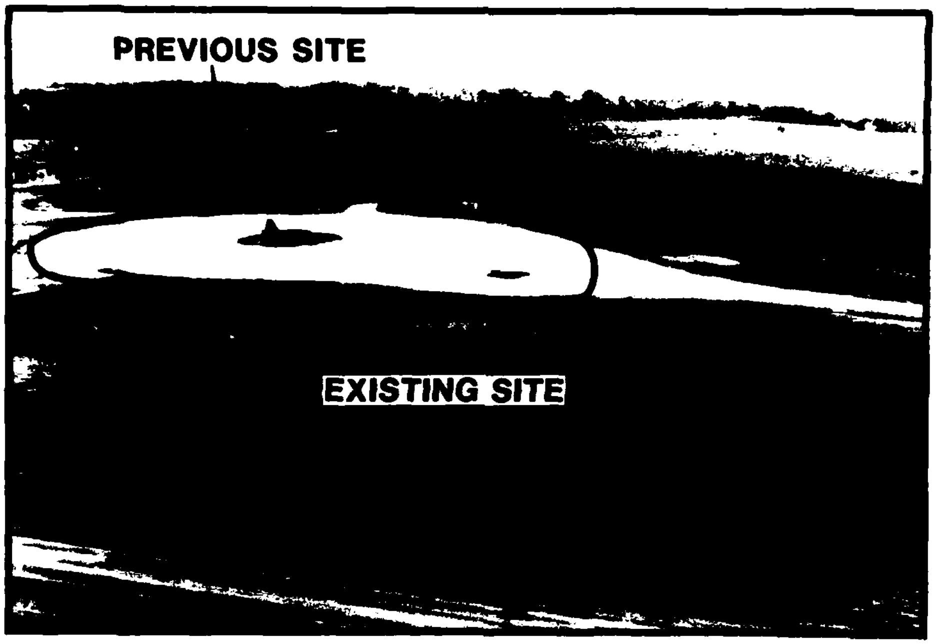


RANDOLPH AFB 1984

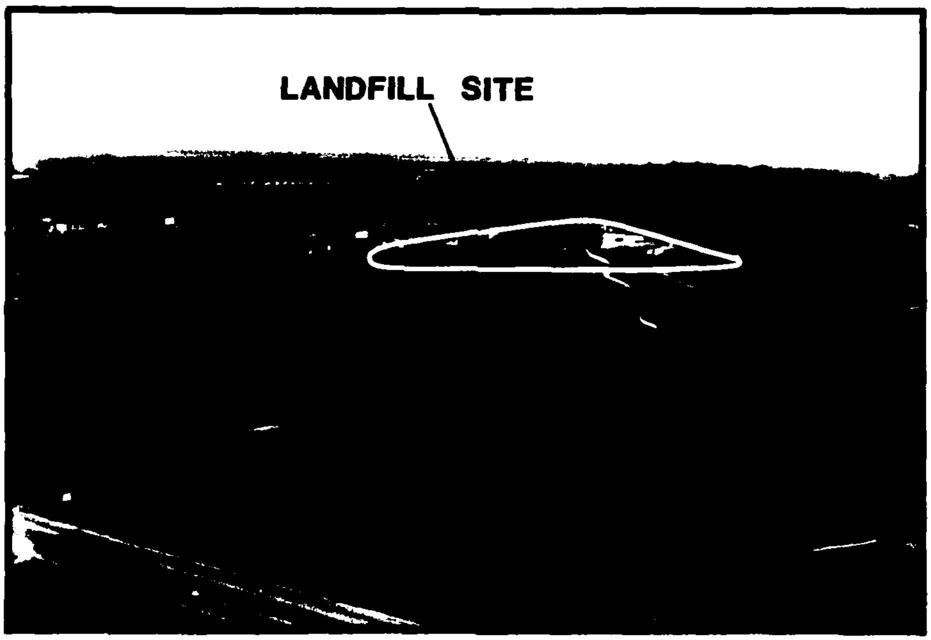


RANDOLPH AFB CIRCA 1950

RANDOLPH AFB

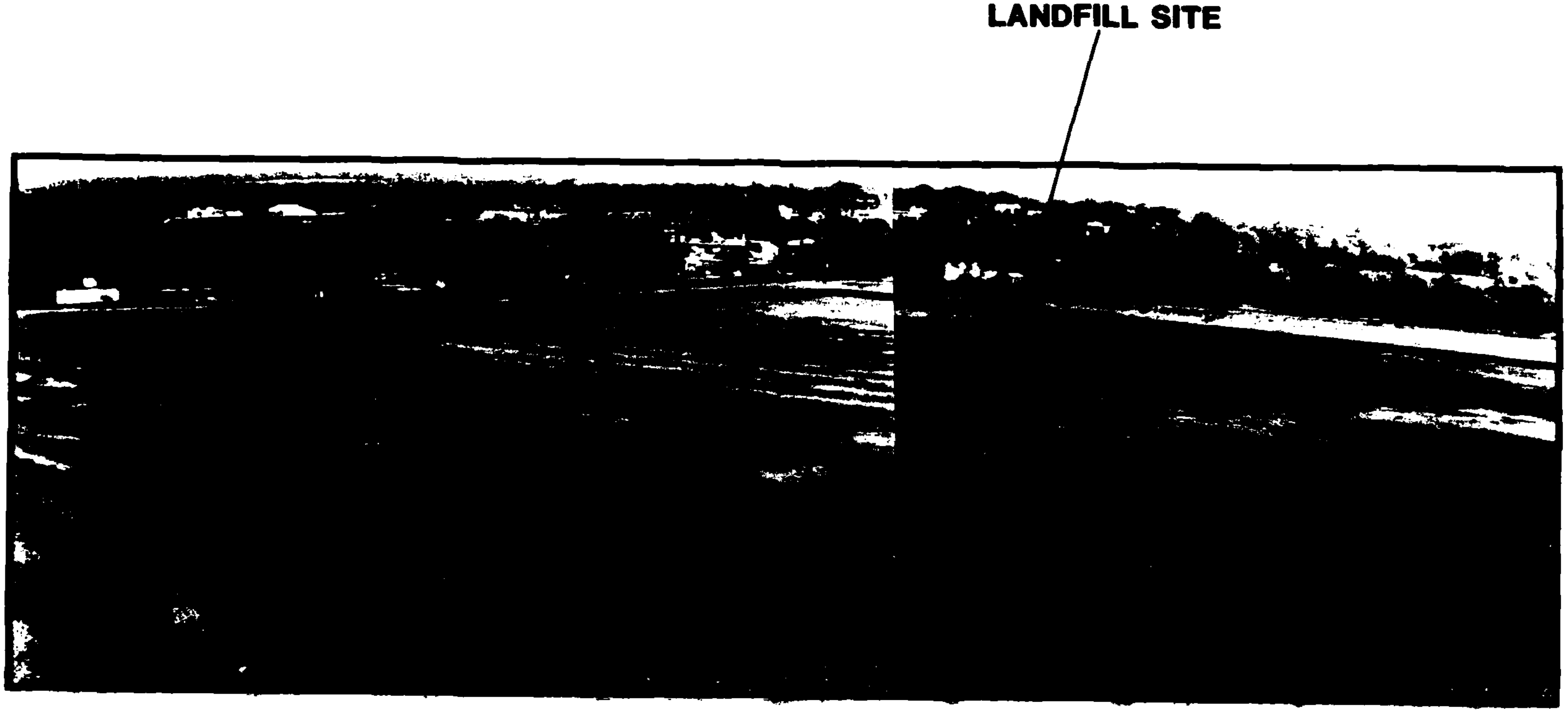


Fire Protection Training Area No. 2



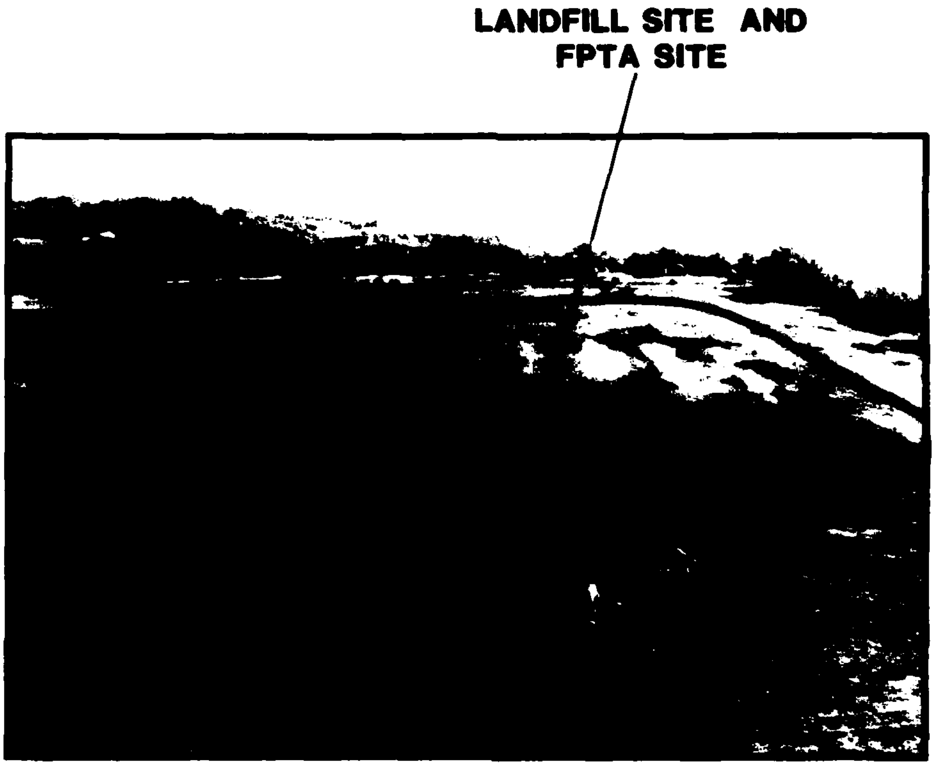
Landfill No. 1

RANDOLPH AFB

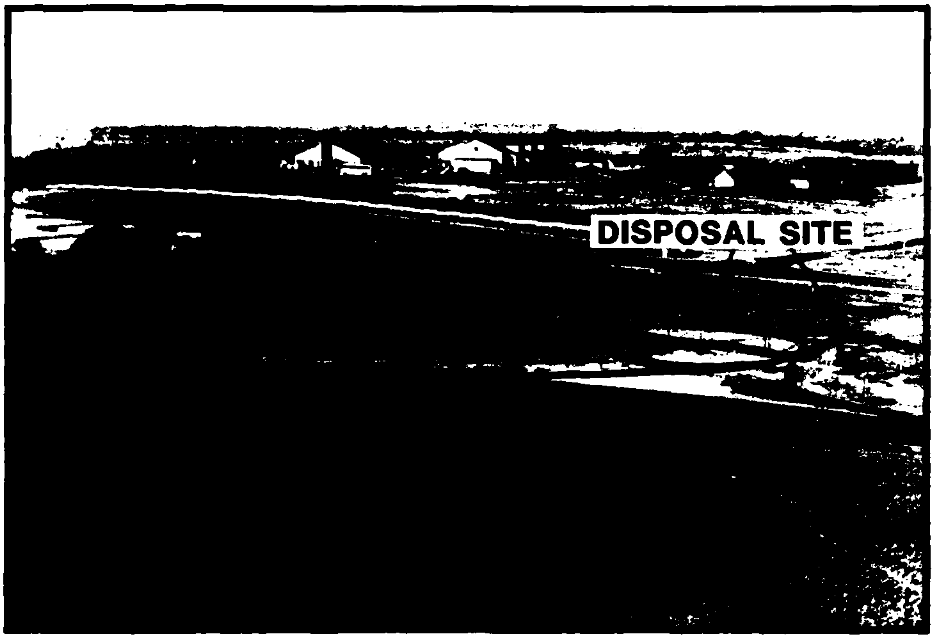


Landfill No. 2

RANDOLPH AFB



Landfill No. 2 and
Fire Protection Training Area No. 3



Randolph AFB –
Low–Level Radioactive Material Disposal Site

Seguin Auxiliary Airfield –
Fire Protection Training Area

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

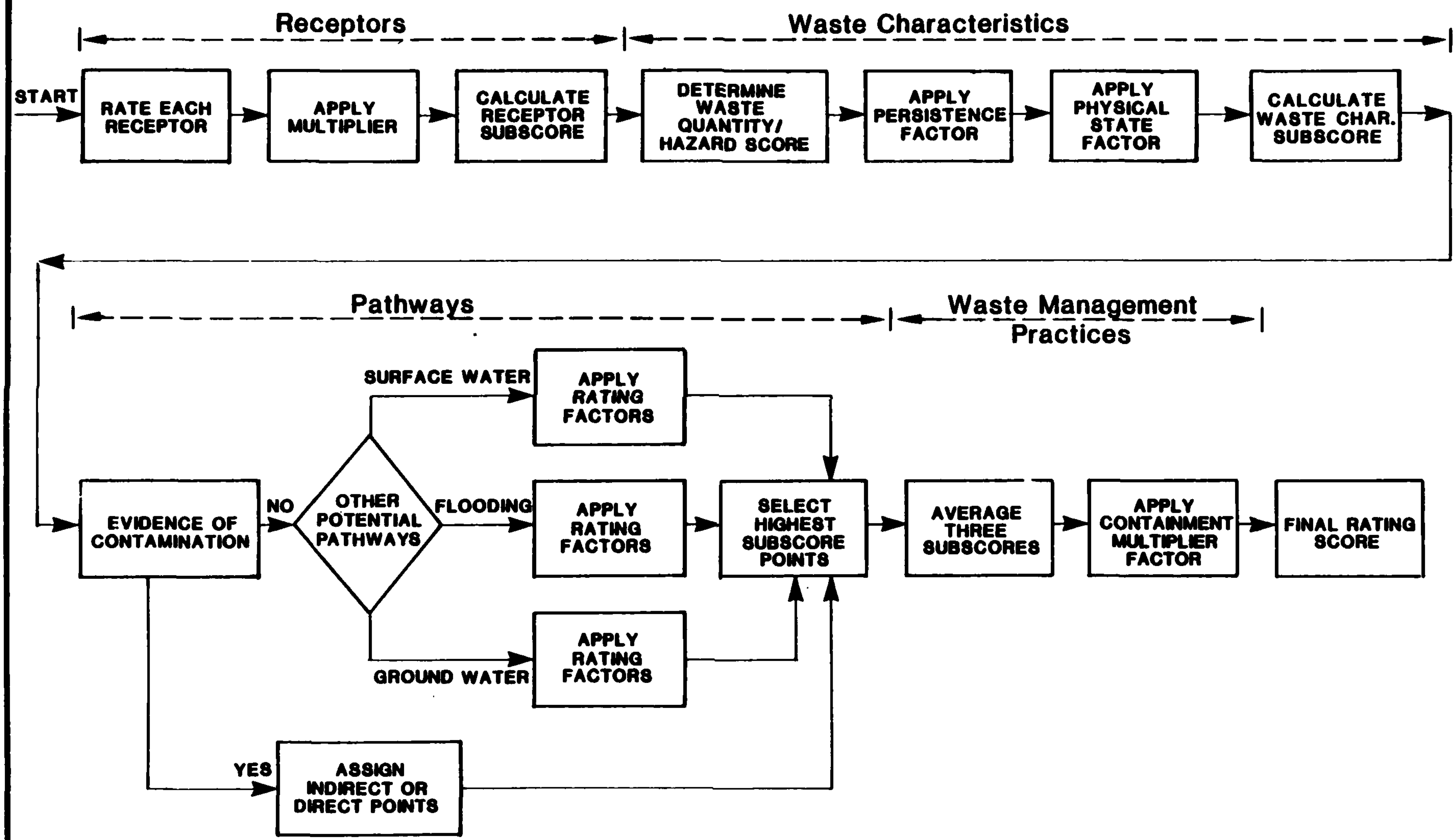


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = $\boxed{\quad}$

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. *WASTE CHARACTERISTICS*

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = *Suspected confidence level*

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

	Rating Scale Levels				
Rating Factor	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE HAZARD ASSESSMENT RATING FORMS

APPENDIX H

INDEX FOR HAZARD ASSESSMENT

METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Landfill No. 2 and Fire Protection Training Area No. 3
Location:N/N' Corner of the base
Date of Operation:1946-1956(Landfill) 1957-58(FPTA)
Owner/Operator: Randolph AFB
Comments/Description: Disposal of thinners,paints,strippers,transformer oils,rags with fuel and other residuals in landfill;buried thinners,solvents,oils, and waste fuels at FPTA
Site Rated by: R.L. Thoem and J.R. Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			115	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) L = large
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.90 = 90

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.00 = 90

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64		
Waste Characteristics	90		
Pathways	50		
Total 204 divided by 3 =		68	Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

68 x 0.95 = 65

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Protection Training Area No. 2 and FPTA fuel tank
Location:S/SE of Bldg 1160 near eastern boundary of base
Date of Operation or Occurrence: late 1940's-1957 and 1959-present
Owner/Operator: Randolph AFB
Comments/Description: Burned thinners,solvents,oils,waste fuels,and clean fuels;also leaky fuel storage tank at site
Site Rated by: R.L.Thoem and J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			107	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		59	
Waste Characteristics		80	
Pathways		50	
Total	189	divided by 3 =	63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 1.00 = 63

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site:POL Tank Sludge Disposal Area
Location:Adjacent to POL tanks (Facility Nos.41101 and 41106)
Date of Operation or Occurrence: 1951 to present
Owner/Operator: Randolph AFB
Comments/Description: Disposed residual sludge from POL tank cleaning

Site Rated by: R.L.Thoem and J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			129	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		72
Waste Characteristics		64
Pathways		35
Total	171 divided by 3 =	57 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

57 x 1.00 = 57

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Tank T-16 (Facility No. 3072)
Location:Between Bldg 62 and 63
Date of Operation or Occurrence: 1947 -1983
Owner/Operator: Randolph AFB
Comments/Description: Suspected leaking tank used for storing waste fluids

Site Rated by: R.L.Thoem and J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			109	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 0.80 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.00 = 40

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	40
Pathways	43
Total 144 divided by 3 =	48 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

48 x 1.00 = \ 48 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Sequin Fire Protection Training Area
Location:Sequin Auxiliary Airfield
Date of Operation or Occurrence: late 1960's -early 1970's
Owner/Operator: Randolph AFB
Comments/Description: Burned contaminated fuels

Site Rated by: R.L.Thoem and J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			85	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		47	
Waste Characteristics		48	
Pathways		43	
Total	138 divided by 3 =		46 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

46 x 1.00 = \ 46 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site:Low-Level Radioactive Material Disposal Site
Location:W/SW corner of base
Date of Operation or Occurrence: 1950's
Owner/Operator: Randolph AFB
Comments/Description:Burial of radioactive medical wastes

Site Rated by: R.L.Thoem and J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.50 = 30

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			32	114
Subscore (100 x factor score subtotal/maximum score subtotal)				28

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		30	
Pathways		43	
Total	130 divided by 3 =		43 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

43 x 0.50 = 22

FINAL SCORE

APPENDIX I

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX I
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABG: Air Base Group

ACFT MAINT: Aircraft Maintenance.

AF: Air Force.

AFB: Air Force Base.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent. AFFF concentrates include fluorinated surfactants plus foam stabilizers diluted with water to a 3 to 6% solution.

AFR: Air Force Regulation.

Ag: Chemical symbol for silver.

AGE: Aerospace Ground Equipment.

Al: Chemical symbol for aluminum.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANTICLINE: A fold in which layered strata are inclined down and away from the axes.

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield to a well or spring.

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

AQUITARD: A geologic unit which impedes ground-water flow.

ARENACEOUS: Sand-bearing or sandy; containing sand-sized particles.

ARGILLACEOUS: Composed of clay minerals or clay-sized particles.

AROMATIC: Description of organic chemical compounds in which the carbon atoms are arranged into a ring with special electron stability associated. Aromatic compounds are often more reactive than non-aromatics.

ARTESIAN: Ground water contained under hydrostatic pressure.

ATC: Air Training Command.

AUTOCLAVE: A method of sterilization by superheated steam under pressure.

AVGAS: Aviation Gasoline.

Ba: Chemical symbol for barium.

BALCONES ESCARPMENT: The long, relatively continuous steeply sloping geomorphological feature formed by faulting that separates the Edwards Plateau (north) from the West Gulf Coastal Plain (south). The Edwards Plateau forms the upper escarpment surface, while the Coastal Plain defines the lower escarpment limits.

BEE: Bioenvironmental Engineer.

BES: Bioenvironmental Engineering Services.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

BIODEGRADABLE: The characteristic of a substance to be broken down from complex to simple compounds by microorganisms.

BOWSER: A portable tank, usually under 200 gallons in capacity.

BX: Base Exchange.

$CaCO_3$: Chemical symbol for calcium carbonate.

CALICHE: Gravel, sand, silt or clay cemented by soluble calcium salts to form a crust or hard layer. A term used to describe a broad variety of "hard pan" conditions in the southwest U.S.

CAMS: Consolidated Aircraft Maintenance Squadron.

CARBON 14: A radionuclide with a 5730 year half-life.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

CERIUM 144: A radionuclide with a 284 day half-life.

CES: Civil Engineering Squadron.

CESIUM 137: A radionuclide with a 30 year half-life.

CHERTY: A precipitated cryptocrystalline silicate rock material. Occurs chiefly as nodules or concretions within a host rock.

CIRCA: About; used to indicate an approximate date.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

CN: Chemical symbol for cyanide.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: An aquitard or other poorly permeable layer which restricts the movement of ground water.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

Cr: Chemical symbol for chromium.

Cu: Chemical symbol for copper.

CURIE: Unit for measuring radioactivity. One curie is the quantity of any radioactive isotope undergoing 3.7×10^{10} disintegrations per second.

DET: Detachment.

2,4-D: Abbreviation for 2,4-dichlorophenoxyacetic acid, a common weed killer and defoliant.

DIP: The angle at which a stratum is inclined from the horizontal.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water.

DO: Dissolved oxygen.

DOD: Department of Defense.

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows.

DPDO: Defense Property Disposal Office.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

EOD: Explosive Ordnance Disposal.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

ES: Engineering-Science, Inc.

FAA: Federal Aviation Administration.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

Fe: Chemical symbol for iron.

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

FTW: Flying Training Wing.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown organic compounds.

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by or underneath a glacier.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water.

HALF-LIFE: The time required for half the atoms present in radioactive substance to disintegrate.

HALOGEN: The class of chemical elements including fluorine, chlorine, bromine, and iodine.

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material.

HARM: Hazard Assessment Rating Methodology.

*HAZARDOUS SUBSTANCE: Under CERCLA, the definition of hazardous substance includes:

1. All substances regulated under Paragraphs 311 and 307 of the Clean Water Act (except oil);

2. All substances regulated under Paragraph 3001 of the Solid Waste Disposal Act;

3. All substances regulated under Paragraph 112 of the Clean Air Act;

4. All substances which the Administrator of EPA has acted against under Paragraph 7 of the Toxic Substance Control Act;

5. Additional substances designated under Paragraph 102 of CERCLA.

*HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste.

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*For purposes of this Phase I IRP report hazardous substances and hazardous wastes are considered synonymous.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

Hg: Chemical symbol for mercury.

HQ: Headquarters.

HWAP: Hazardous Waste Accumulation Point.

HYDROCARBONS: Organic chemical compounds composed of hydrogen and carbon atoms chemically bonded. Hydrocarbons may be straight chain, cyclic, branched chain, aromatic, or polycyclic, depending upon arrangement of carbon atoms. Halogenated hydrocarbons are hydrocarbons in which one or more hydrogen atoms has been replaced by a halogen atom.

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

ISOTOPE: Two or more species of atoms of the same chemical element, with the same atomic number and place in the periodic table, and nearly identical chemical properties, but with different atomic mass numbers and different physical properties; an example may be the radioactive isotope Carbon-14.

JP-4: Jet Propulsion Fuel Number Four, military j t fuel.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

LITHOLOGY: The description of the physical character of a rock.

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color.

LOX: Liquid oxygen.

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone.

m: Milli (10^{-3})

MARL: An earthy substance consisting of 35-65% clay and 65-35% carbonate, formed as a result of calcium carbonate precipitation and clay particle sedimentation.

MEK: Methyl ethyl ketone.

METALS: See "Heavy Metals".

ug/l: Micrograms per liter.

mg/l: Milligrams per liter.

MGD: Million gallons per day.

MIBK: Methyl isobutyl ketone.

MICRO: u (10^{-6}).

Mn: Chemical symbol for manganese.

MOA: Military Operating Area.

MOGAS: Motor gasoline.

MONITORING WELL: A well used to measure ground-water levels and to obtain samples.

MSL: Mean Sea Level.

MWR: Morale, Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929.

Ni: Chemical symbol for nickel.

NOAA: National Oceanic and Atmospheric Administration.

NPDES: National Pollutant Discharge Elimination System.

NRC: Nuclear Regulatory Commission

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMS: Organizational Maintenance Squadron.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

OSI: Office of Special Investigations.

O&G: Symbols for oil and grease.

Pb: Chemical symbol for lead.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

PD-680: Cleaning solvent (Stoddard Solvent).

PERCHED WATER TABLE: A water table above a relatively impermeable zone underlain by unsaturated rocks of sufficient permeability to allow ground-water movement.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PERSISTENCE: As applied to chemicals, those which are very stable and remain in the environment in their original form for an extended period of time.

PESTICIDE: An agent used to destroy pests. Pesticides include such specialty groups as herbicides, fungicides, insecticides, etc.

pH: Negative logarithm of hydrogen ion concentration.

pico: 10^{-12}

PL: Public Law.

POL: Petroleum, Oils and Lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POLYCYCLIC COMPOUND: All compounds in which carbon atoms are arranged into two or more rings, usually aromatic in nature.

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

ppb: Parts per billion by weight.

ppm: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

RCRA: Resource Conservation and Recovery Act.

RECEPTORS: The potential impact group or resource for a waste contamination source.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RECON: Reconnaissance.

RIPARIAN: Living or located on a riverbank.

RM: Resource Management.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SARPMA: San Antonio Real Property Maintenance Agency

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SAX'S TOXICITY: A rating method for evaluating the toxicity of chemical materials.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream.

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

STRIKE: The compass direction or trend taken by a structural feature, such as bedding, folds, faults, etc. Strike is measured at a point when the specific feature intersects the topographic surface.

SUPONO: Trade name for the pesticide 2-chloro-1-2, 4-dichlorophenyl vinyl diethyl phosphate.

TA: Training Annex

TAC: Tactical Air Command

TCE: Trichloroethylene, a solvent and suspected carcihogen.

TDS: Total Dissolved Solids, a water quality parameter.

TECTONIC (ally): Said of or pertaining to the forces and resulting structural or deformational features evident in the earth's crust. Tectonics usually deals with the broad architecture of the earth's outer crust.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TREATMENT OF HAZARDOUS WASTE: Any method, technique or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

TSD: Treatment, storage or disposal.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of groundwater.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USDA: United States Department of Agriculture.

USEPA: United States Environmental Protection Agency.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

WATER TABLE: *Surface of a body* of unconfined ground water at which the pressure is equal to that of the atmosphere.

WWTP: Wastewater Treatment Plant.

Zn: Chemical symbol for zinc.

APPENDIX J

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APPENDIX J
REFERENCES

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APPENDIX K

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION

SITES AT RANDOLPH AFB

APPENDIX K
INDEX OF SITES WITH POTENTIAL FOR ENVIRONMENTAL CONTAMINATION

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